PUBLIC WORKS

Dec. 1955

CITY, COUNTY AND STATE

Dwight Metzler is Chief Engineer of the Kansas State Board of Health, a position he has held for the past seven years. More data on page 26.

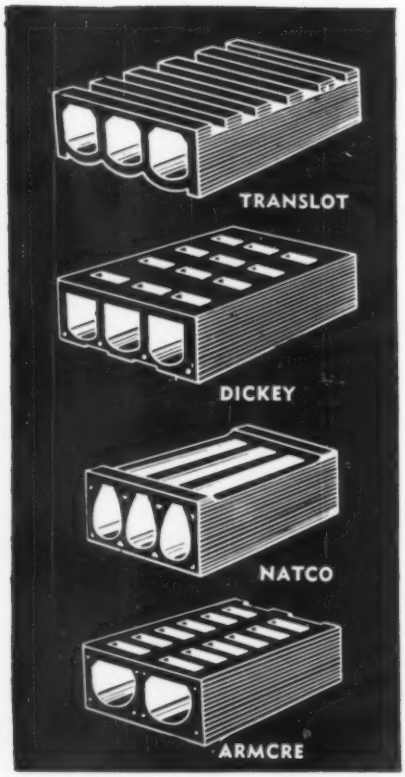
GARLAND, TEXAS, sewerage treatment plant includes one 65' primary clarifier, one 45' final clarifier one 100' high rate trickling filter, two 110' standard rate filters. Designed by Homer A. Hunter, Consulting Engineer, equipment by Ralph B. Carter, bar screen by Chain Belt Co. TFFI blocks by Texas Vitrified Pipe Company.

Why Trickling Filters are best—

EASY TO EXPAND

Trickling filters, properly designed, are easy to expand to meet future increases in population or loading. Another filter, or perhaps a change from low rate to high rate, will solve the problem for many years to come.

You'll be sure to get maximum results from trickling filters when you install TFFI *vitrified clay filter bottom blocks*. The full illustrated story of their advantages, efficiencies, and economies is in the new 1954 revised edition of the popular HANDBOOK OF TRICKLING FILTER DESIGN. If you lack a copy, just write any member of the Institute listed below for one. It's free.



TRICKLING FILTER FLOOR INSTITUTE

Bowerston Shale Co.
Bowerston, Ohio

Texas Vitrified Pipe Co.
Mineral Wells, Tex.

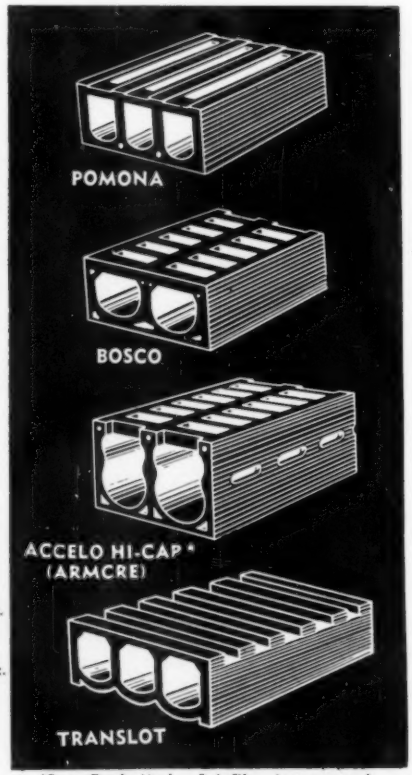
Pomona Terra-Cotta Co.
Pomona, N. C.

Cannelton Sewer Pipe Co.
Cannelton, Ind.

W. S. Dickey Clay Mfg. Co.
Kansas City 6, Mo.

Ayer-McCarel Clay Co., Inc.
Brazil, Ind.

Natco Corporation
Pittsburgh 22, Pa.



*Reg. Trade-Mark of Infilco Incorporated.

Eight 110-ft. diameter Chicago-Wiggins Lodek Covers at the City of Philadelphia Southwest Disposal Plant.

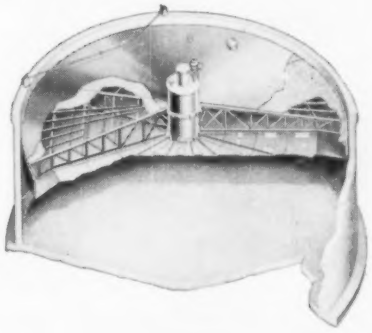
ASK LEADING ENGINEERS ABOUT....

Chicago-Wiggins*

DIGESTER COVERS and GAS HOLDERS

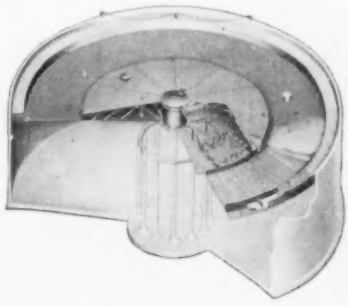
Ask leading engineers why, in the past four years, they have specified Chicago-Wiggins Digester Covers and Gas Holders for more than 50 major installations. They'll tell you about the maximum gas pressures that are possible, the positive scum submergence and the non-tipping feature of Chicago-Wiggins Covers. They're sure to mention superior structural design which provides the highest live load safety factor of any cover. They will explain how lower ceiling plate stresses are achieved through modern welding and design; how a positive anti-rotation device keeps trusses always above tank corbels.

The features that have earned this preference by consulting and design engineers are yours when you specify Chicago-Wiggins Digester Covers and Gas Holders. Write Dept. H for complete details.



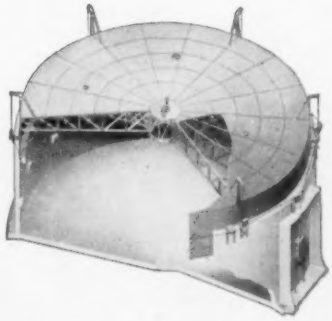
PONTOON COVERS

Always float on liquid—never on gas.



LODEK COVERS

Lowest first cost for 75-ft. to 150-ft. diameters.



WET GAS HOLDERS

Self balancing with a positive seal. Economical in first cost and in maintenance.

CHICAGO PUMP COMPANY
Subsidiary of Food Machinery and Chemical Corporation
SEWAGE EQUIPMENT DIVISION
622 DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS

Flush Kleen ®, Scru-Peller ®, Plunger, Horizontal and Vertical Non-Clogs Water Seal Pumping Units, Samplers . . Swing Diffusers, Stationary Diffusers, Mechanical Aerators, Combination Aerator-Clarifiers, Barminutor ®, Comminutors.

**Chicago-Wiggins Digester Covers and Gas Holders are products designed specifically for sewage digesters. They are the result of the combined experience of Chicago Sewage Engineers and Mr. John H. Wiggins, designer of the well-known Wiggins Floating Cover, of which more than 5000 have been built in the last 25 years.*

Public Works T. M. Reg. U.S. Pat. Off.

Established 1896

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PUBLIC WORKS MAGAZINE

CONTENTS

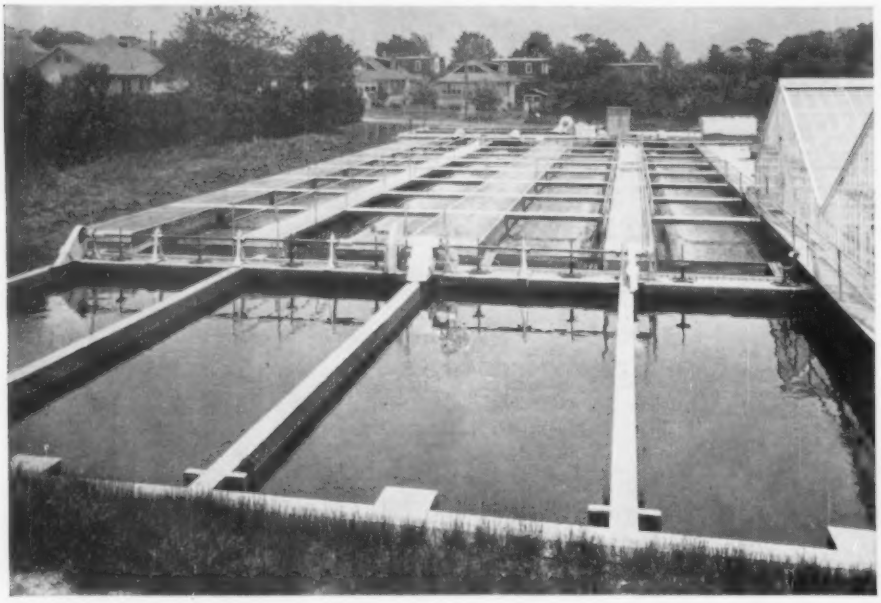
DECEMBER, 1955 **Vol. 86, No. 12**

PUBLIC WORKS DIGESTS

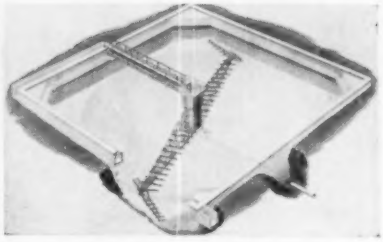
DEPARTMENTS AND SECTIONS

THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES

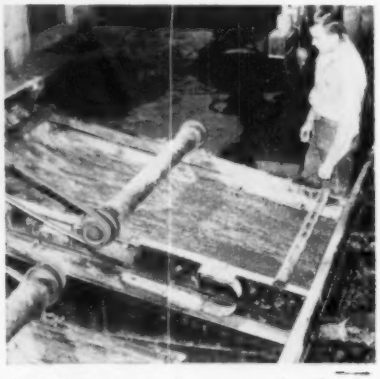
Call on LINK-BELT for water, sewage and waste treatment equipment built to last



STRAIGHTLINE COLLECTORS for rectangular settling tanks. Peak-cap bearings, pivoted flights and Straightline action all contribute to top efficiency. *Chain in system shown installed in 1930 gave 15 years of continuous 24 hour service before replacement.*



CIRCULINE COLLECTORS for square or round tanks for quick, positive sludge and scum removal in shortest time without septicity.



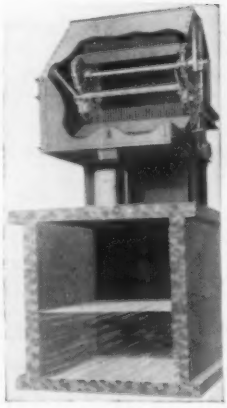
LIQUID SCREENS have proved efficient and economical for removing solids from industrial liquids. Available in several sizes with fine cloth.

ONE SOURCE . . . ONE RESPONSIBILITY

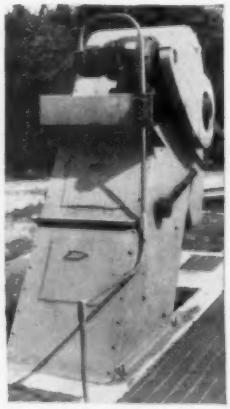
LONG life decides the eventual economy of sanitary waste treatment equipment. And after years of operation, Link-Belt systems in cities both large and small continue to provide highly effective water purification and sewage treatment service . . . with negligible maintenance expense.

Link-Belt equipment has also been welcomed in industrial plants of all kinds — particularly in states having strict anti-pollution legislation. For Link-Belt equipment can dispose of wastes at lowest cost — recover by-products for highest profit.

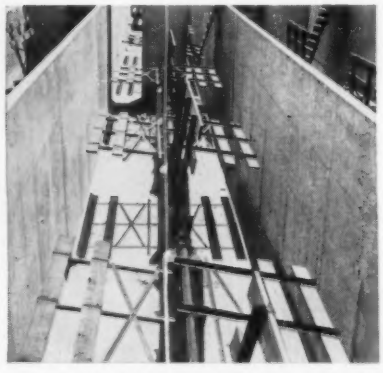
Link-Belt offers you a broad line of top-quality equipment . . . plus engineering proficiency acquired in over 34 years' experience. Our specialists will be glad to work with your own engineers, chemists and consultants to bring you the finest in modern treatment methods. Call your nearest Link-Belt office for full information and catalogs on the Link-Belt products shown here.



THRU-CLEAN BAR SCREENS — Remove large floating particles from large volumes of water — thus protect other equipment.



TRITOR SCREENS — For small sewage treatment plants—remove both grit and screenings with one mechanism.



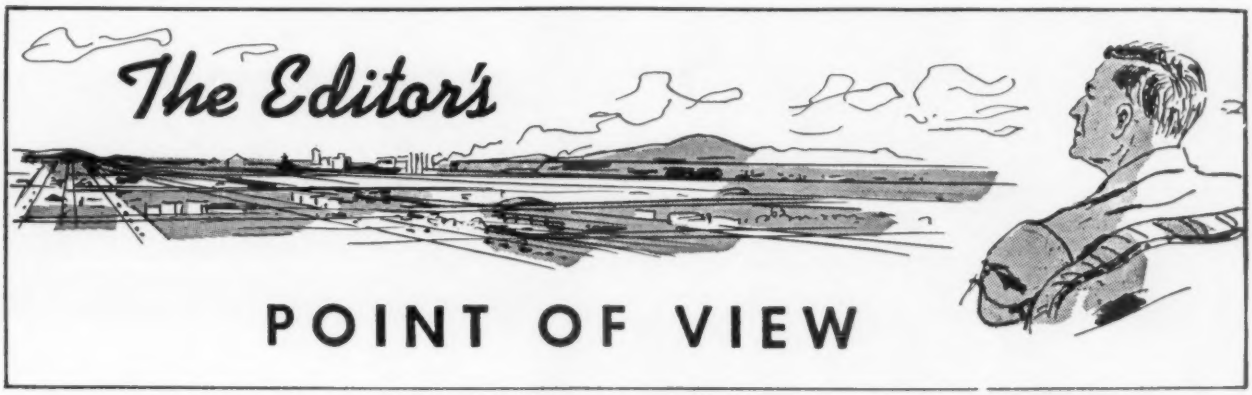
CHEMICAL MIXERS — Link-Belt builds Straightline (shown) and flash mixers. Efficiency is assured by operation at variable speed for maximum floc formation.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

LINK-BELT COMPANY: Executive Offices, 307 N. Michigan Ave., Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World.

13 777



Year-End Greetings to Our Readers

THOUGH this issue will reach our readers nearly a month ahead of the holiday season, we take this opportunity of wishing all of you a Merry Christmas and a Happy and Prosperous New Year. May this coming year bring you happiness and good fortune, plenty of work at an interesting job and the satisfaction of a task well-accomplished. If good fortune is your lot, may you enjoy it the more by sharing it with others; and if you should yourself need comfort and understanding, may there be friends always at hand.

A Public Works Program for the New Satellite

NOW THAT scientists are planning new satellites, even though the first one may be no larger than a basketball, we ought to start at least one planning board at work on public works projects for future bigger and better satellites. Perhaps first of all will be a landing strip for visitors and for bringing in food and other necessities; next there must be a road connecting the landing strip to the living area; and what about water, sewage disposal, getting rid of refuse and doing all the other things that now-a-days we expect to be provided for an up-to-date community? Before we go starting any king-sized artificial moons, we ought to think about public works programs for them.

What About Water, Food and Waste Disposal When a City is Evacuated?

THE PROBLEMS of providing water and food for an Army are big ones. They take organization, manpower and lots of equipment; and combining these three into an effective whole requires considerable training. Stonewall Jackson's army of only eighteen thousand men marching from the Shenandoah Valley to the Seven Days' battles drank all the roadside wells dry and still suffered severely from thirst. What is going to happen to the million or more which, it is blithely planned, will exacuate a major city to escape a bombing attack? There aren't many roadside wells in the areas they will be going through; and if there were, did any of our readers ever try to water as many as two hundred people at a single watering point? And if they did succeed, with what? Will everyone carry paper cups? These are only a few of the questions that are unsolved in our mind. We have looked hopefully in the numerous articles on civil defense that have appeared in this magazine; none has touched upon this point, nor on other points associated with it. Will the passing multitude have read Moses' commandment about sanitation; or will the area through which it passes quickly become a nuisance and a danger to health?

Tools and Methods Are Already Available for Helping Meet that Water Shortage

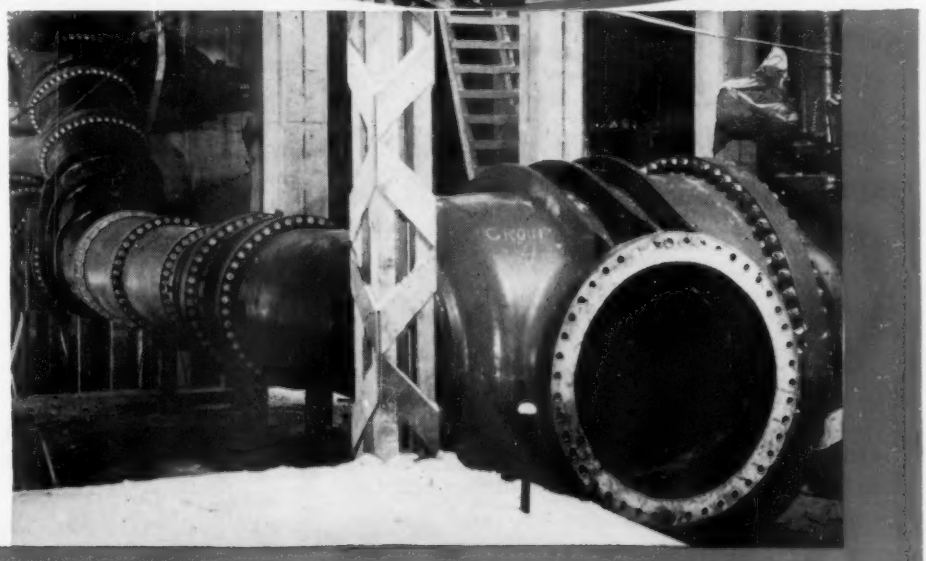
AS WE have frequently pointed out, many of the water shortages that have plagued a third or more of our cities over the past few years are due to lack of distribution facilities rather than basic shortage of water. It takes time and it costs a lot of money to lay pipe lines; where they are needed, they should be built at the earliest possible moment. Sometimes, though, it is possible to make better use of what is already available, mitigating the situation materially. Two basic tools that can be used for failing water pressure at the far ends of lines, and also for getting the most out of your system in other ways, are cleaning the mains, and finding and repairing leaks.

Cleaning the pipes of the distribution system can bring a lot more water to those end-of-the-line customers who have been complaining about no pressure at certain hours of the days. Pipe cleaning may also add as much as a third to the capacity of the pipe line from the reservoir or pumping plant to the city. Leaks can be located and stopped, by methods that are well recognized; and doing this may add anywhere from ten percent up to the supply of usable water. The unaccounted-for water in most municipalities represents a sizeable figure, judging from the reports that reach this office; reducing this loss could go a long way in many places to meet the shortage while needed long-range steps are being undertaken.

toughness and long life

Installing 18" Flexible Joint cast iron pipe for sewer line from mainland to Sherman's Island, Panama City, Florida.

36" cast iron cement-lined pipe for discharge header from pump house to main transmission line in water supply system of Houston, Texas.



Installation of cast iron pipe and fittings in large filtration plant in Chicago, Ill.

SERVES FOR CENTURIES...

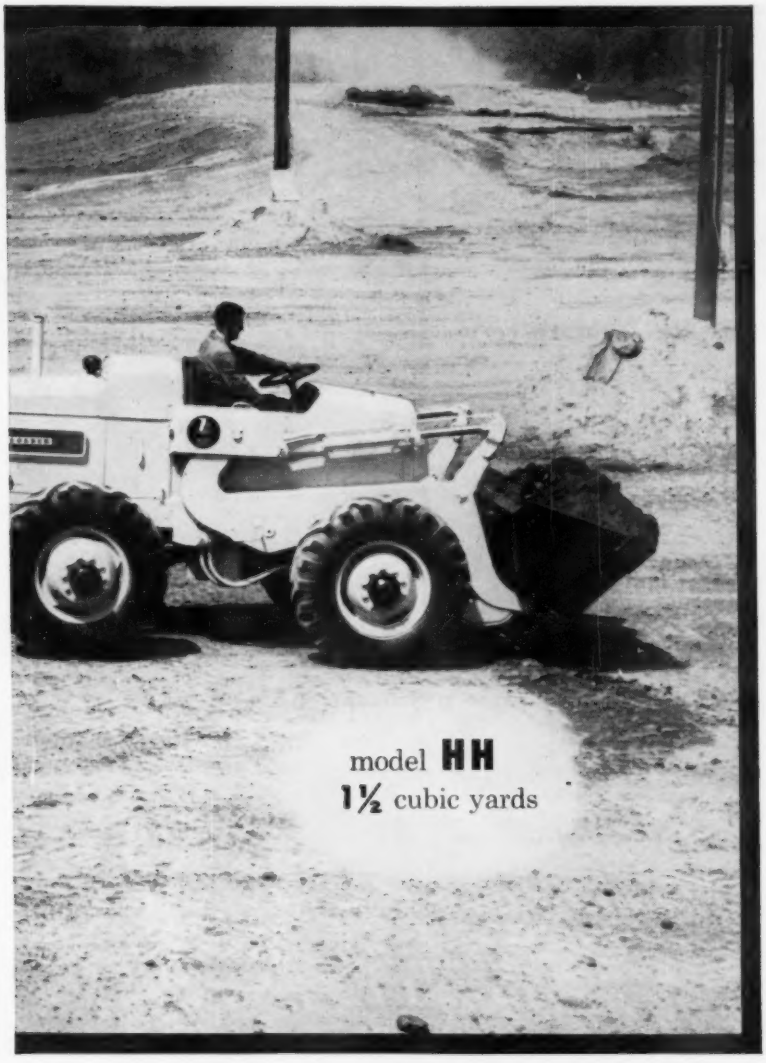
Now's the time to mail this month's Readers' Service Card.

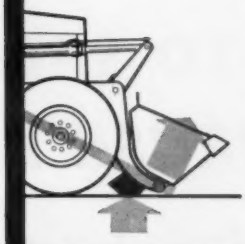
the Big Three in

All new in design... New in performance

If you want the utmost in wheeled tractor-shovel performance, you want four-wheel-drive, and for the finest in four-wheel-drive you now have a choice of these three "PAYLOADER" sizes. They're all *new*, and each one is way ahead of its class in digging power, carrying capacity, stability, safety and operator comfort. They all feature an amazing new bucket action and boom arm design that is the big reason for the new performance pace they are setting for contractors, public bodies, mines, quarries, utilities.

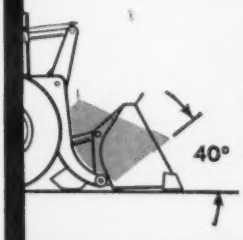
There's more horsepower per bucket capacity and many other proven Hough advantages that boost output and lower the cost of digging, scooping-up, loading, moving and piling earth and bulk materials. They all feature torque converter drives and multiple speeds in both directions as well as a new closed, pressure-controlled hydraulic system that minimizes dirt-intake and oil-foaming troubles. Your Hough Distributor is ready to demonstrate these great new "PAYLOADER" units and what they can do for you.





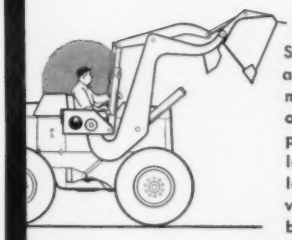
POWERFUL PRY-OUT ACTION

Tremendous pry-out force is obtained by using the breakout pads on the ground as a fulcrum for leverage. The load forces opposing the pry-out action are thus transferred to the ground through the pads instead of to the axle, wheels and hydraulic system of the machine.



40° BREAK-OUT at Ground Level

You can get HEAPED BUCKET LOADS and you get them FASTER and EASIER WITH THIS NEW BUCKET ACTION. Most important of all — you KEEP BIGGER PAYLOADS — because the bucket can be tipped back a full 40 degrees at ground level before it is raised, eliminating spillage.



SAFETY and STABILITY

Special boom-arm shape and positioning keeps moving members out of operator's reach at all positions. Close, low, load-carry position and longer wheelbase provide stability and balance for fast maneuvering — with safety.

Four-Wheel Drive

Your Hough Distributor's continues to be the place to get the most performance and satisfaction for your tractor-shovel dollar. For he sells the "PAYLOADER" line of wheeled tractor-shovels — the pioneer line and the most-proven, most complete line available. He has a "PAYLOADER" size to meet your requirements, whether for four-wheel-drive, rear-wheel-drive or front-wheel-drive types — along with the finest parts and service facilities to protect your tractor-shovel investment.

PAYLOADER®
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THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
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Title .....

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City .....

State .....

BOOKS IN BRIEF

OPPORTUNITIES FOR YOUNG ENGINEERS

Here is a good 16-page catalog gineers" by the U. S. Department entitled "Opportunities in the Bureau of Public Roads for Young Enof Commerce. It provides information for college students interested in careers in highway or highway bridge engineering. Copies are 25¢ from the Personnel and Training Office, Bureau of Public Roads, Washington 25, D. C.

TASTE AND ODOR CONTROL

Taste and Odor Control in Water Purification is an 80-page book which covers the history of developments in this field; sources of bad tastes and odors, such as algae; determination of odor concentration; and means of control. Copies on request from Industrial Chemical Sales Division, 230 Park Ave., New York 17, New York.

HIGHWAY OFFICIALS AND ENGINEERS

The 1955 edition of ARBA's convenient, pocket-sized directory of "Highway Officials and Engineers" is now available. The cost is $1.00 per copy. American Road Builders' Association, World Center Building, Washington 6, D. C.

CHICAGO ANNUAL REPORT

The annual report for 1954 for Chicago, Ill., is an attractive and well-prepared book of 32 pages. It presents the functions and major accomplishments of the city in a simplified manner. For clarity of presentation, departmental operations are presented under the following headings: Super highways, Subways, Parking Garages, Waterworks, Sewers, Bridges, Waterways, Public Buildings, Recreation, Forestry and Aviation. More detailed information concerning the departments' functions and responsibilities may be obtained upon request. This report was prepared by George L. DeMent, Commissioner of Public Works, Room 406, City Hall, Chicago 2, Ill.

Take the "sting" out of hydrant damage with DARLING QUIKFIX B-50-B's

HERE'S an unmatched combination for those locations where traffic mishaps are frequent. First, you gain all the unique advantages of Darling's standard B-50-B design, with its ball bearing operation and "O" ring seals. Easier, quicker operation . . . no packing gland maintenance . . . no water seepage to operating threads or bearings . . . no loss of lubricant.

And when destructive impact does occur, Darling's improved breakable barrel and valve rod couplings "take the rap". Both hydrant barrel sections remain undamaged and intact. Moreover, on-the-spot repair is a quick cinch. Note how the barrel coupling is segmented—four pieces —for easiest, minimum part replacement.

Better get *all* the facts about Darling QUIKFIX B-50-B's and see how *much* you can gain and save. Write:

DARLING VALVE & MANUFACTURING CO.

Williamsport 22, Pa.

Manufactured in Canada by The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ont.

Now's the time to mail this month's Readers' Service Card.

3 NEW BIG GALION GRADE-O-MATIC MOTOR GRADERS

Models

T-700
190 H.P.
40,125 lbs.

T-600
140 H.P.
29,800 lbs.

T-500
125 H.P.
25,000 lbs.
with scarifiers

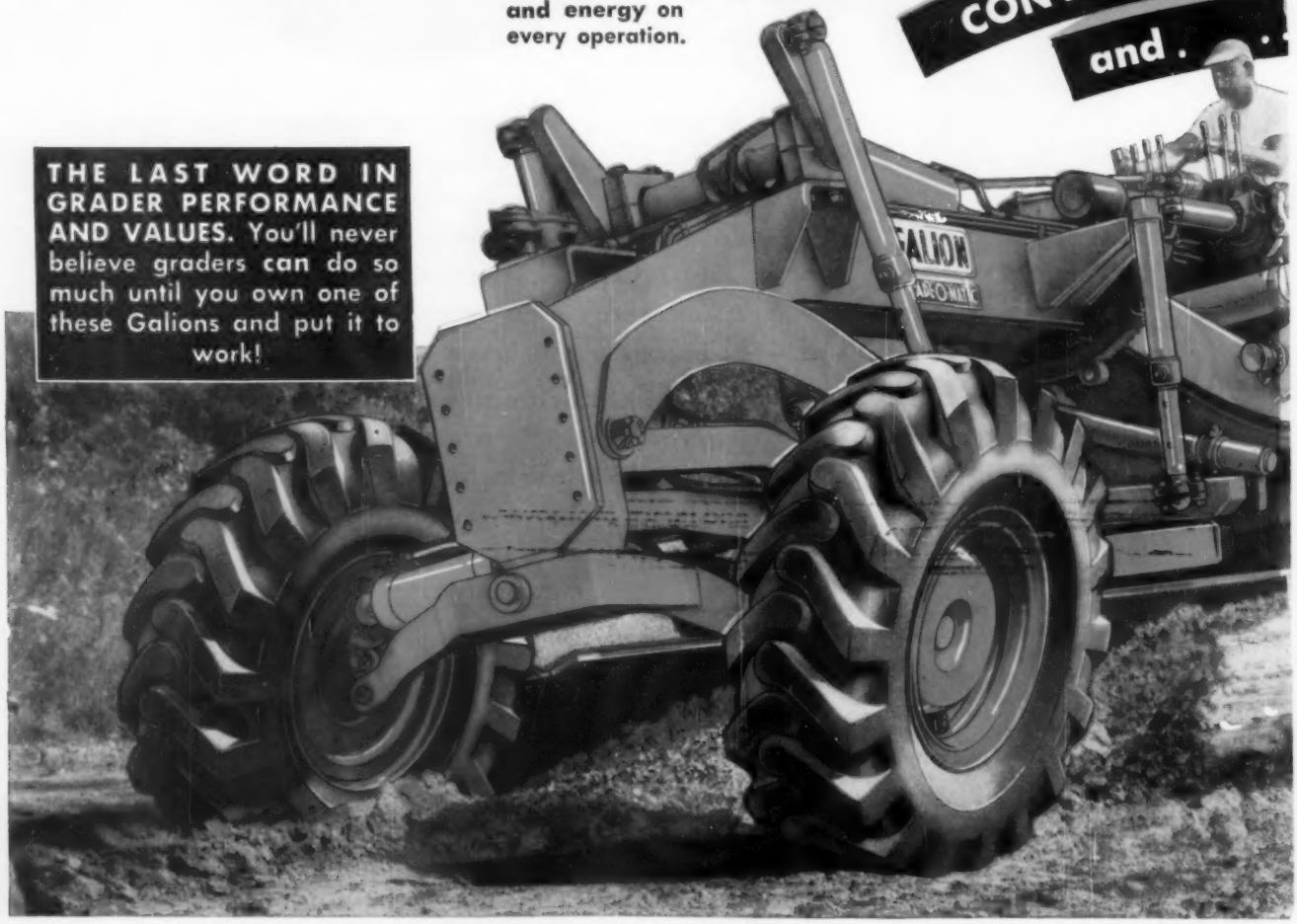
WEIGHT FOR WEIGHT they have more "PUSH-POWER" at the blade than any other motor graders built. They are also the most productive and easiest to operate, because they have what you've always wanted — POWER BALANCED TO MATCH WEIGHT. They utilize their power without useless, costly spinning of the drive wheels. Every part is designed for size, weight, strength, and type of metal to function in proportion to their tremendous "PUSH-POWER" at the blade.

These three **GALION GRADERS** also have what you now need — **GALION GRADE-O-MATIC DRIVES** (torque converters and power-shift transmissions). **EASY TO SHIFT**, much like the best automobiles, the shifting work is done for you. All you do is move the fingertip control levers. You can shift "**on the go**" in either direction. With the T-700 you have 3 speeds forward, 3 speeds reverse — with the T-600 and T-500 you have 4 speeds each direction — from creeper to high travel speed.

The old type heavy duty **FOOT CLUTCH IS GONE**, together with its tiresome clutching and declutching. You get **FAST WORK CYCLES** because you can reverse smoothly and quickly, save time and energy on every operation.

WITH TORQUE CONVERTERS and . . .

THE LAST WORD IN GRADER PERFORMANCE AND VALUES. You'll never believe graders can do so much until you own one of these Galions and put it to work!

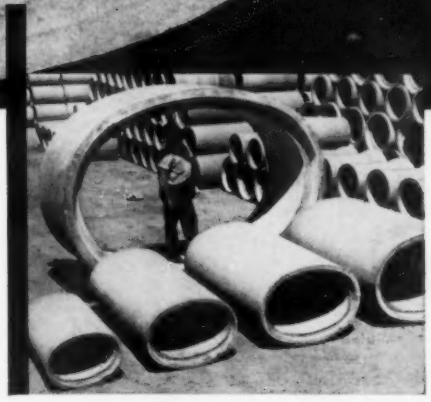


LO-HED Reinforced Concrete Pipe for Culverts and Sewers

Greater Capacity . . . Faster, Easier Installation . . . Less Cost!

Elliptical LO-HED Pipe carries a greater flow than its round equivalent—in a minimum depth of cut with increased depth of cover. LO-HED Pipe is easier to lay, to grade and line. Smooth walls and tight joints insure maximum hydraulic capacity, with a minimum build-up of debris in the invert, even under low-flow conditions. Furnished in pre-tested strengths to answer any low headroom problem, including culverts under highways and railroads.

Write today for specifications on time and money-saving LO-HED Reinforced Concrete Pipe.



A full range of sizes in LO-HED Pipe is available for nearly all culvert and drainage installations.

New brochure available containing hydraulic characteristics and discharge diagrams for all sizes. Write today for your free copy.

AMERICAN-MARIETTA COMPANY
CONCRETE PRODUCTS DIVISION

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Universal Concrete Pipe Co.

Need more facts about advertised products? Mail your Readers' Service card now.

EXCLUSIVE

Spot-Spreading—as a Clamshell

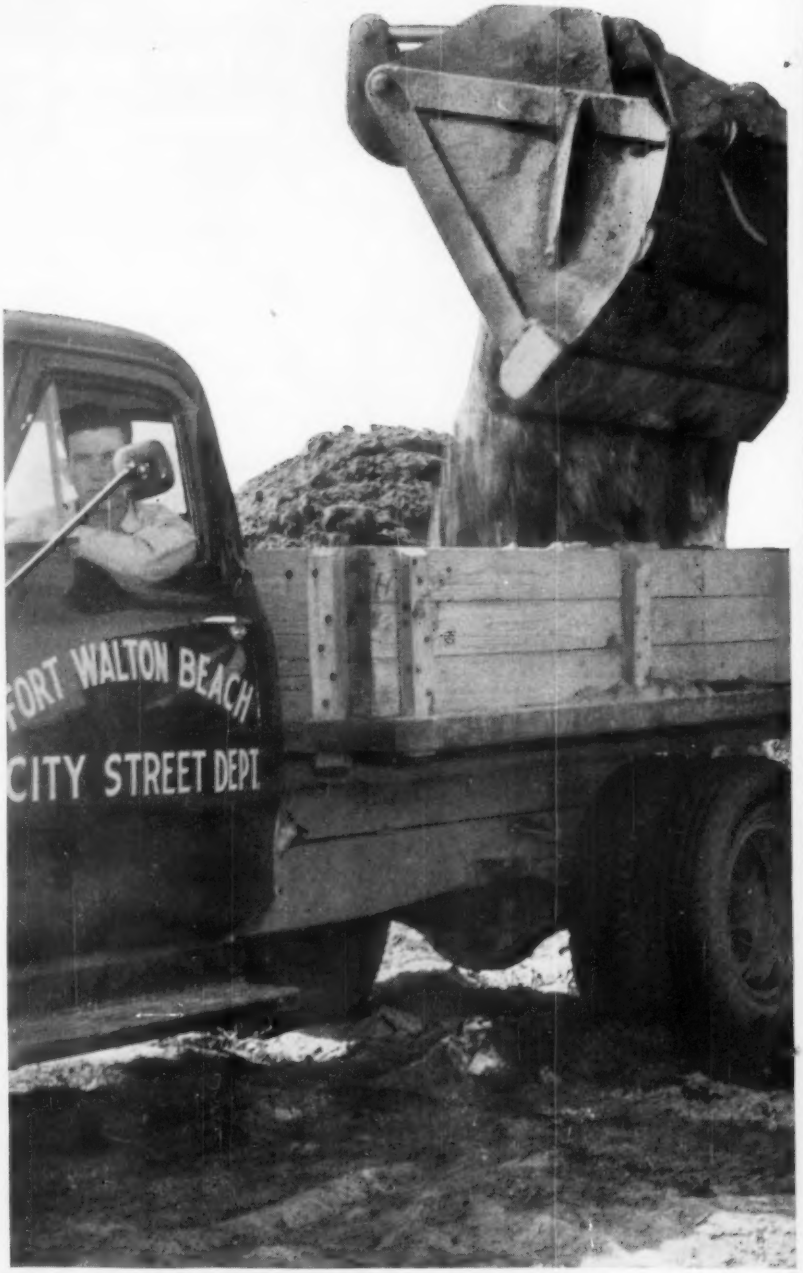
See how Clamshell action, obtained by a finger-tip flick of the "machine selector" lever, enables the operator to pick up and spot-place or spread refuse at any point—without disturbing any already compacted material. This speeds the operation and helps produce uniform layers of refuse.

Working as responsive Bulldozer

The operator simply moves the "machine selector" to get bulldozer action, when needed—to spread an even layer of cover dirt over the refuse. You regulate depth of cut accurately by "radius control" of blade pitch forward or backward hydraulically.

Filling-up—to "iron" as a Bullclam

This 1½-cubic yard bucketful of dirt adds over a ton of weight to the Four-In-One for Bullclam duty. This added weight greatly increases the down-pressure exerted by compaction plate and clam curvature design—so that the exclusive ironing action compresses cover and refuse into perfect *fill-density* condition, to eliminate pest pockets.



Loading—as a Skid-Shovel

The District's International Drott TD-9 Four-In-One Skid-Shovel loads beach sand into trucks for cover dirt—thus saves long "carries," and helps keep other equipment busy. As a Skid-Shovel the machine can excavate hard materials and "float skid" its loads—to avoid carry strain on the tractor!

INTERNATIONAL DROTT

Four-in-One

is Bulldozer, Bullclam, Skid-Shovel, Clamshell

—for Oskaloosa County Mosquito Control District, Ft. Walton Beach, Florida

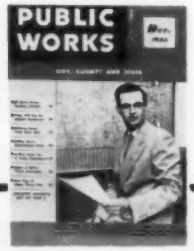
Oskaloosa County Mosquito Control District operates a sanitary landfill for Fort Walton Beach, Florida. The District purchased the International Drott Four-In-One primarily because of its great versatility in spreading, compacting, and covering refuse—and in loading cover dirt for distance hauling. Besides, this unit fills in low mosquito "hatcheries" and has cleared up and covered an odorous, old rat-haven, open dump area. In winter tourist season this International Drott TD-9 Four-In-One Skid-Shovel is the key to handling sanitary landfill disposal for 19,000 people!

INTERNATIONAL HARVESTER

INTERNATIONAL®
DROTT

• **See how your city** can get *four-machine utility from one moderate investment.* The Four-In-One can excavate and load; grade, strip, doze and backfill; handle all sanitary landfill duties for a good-sized population. And see why, for a separate full-time sanitary fill machine, the International Drott Bullclam is used by more cities than any other type of equipment! Prove to yourself nothing else compares with International Drott advantages. See your International Drott distributor for a demonstration.

condition, to eliminate pest pockets.



Dwight F. Metzler is Chief Engineer of the Kansas State Board of Health, a position he has held for the past seven years. In this time, there have been completed or placed under contract 160 new municipal sewage treatment plants and a good many industrial waste disposal installations. Mostly this has been done because Dwight Metzler has convinced the people of Kansas that water pollution is sinful and cannot be tolerated. He says: "I've had a lot of fun running around over the state talking to city officials and speaking to public groups." A native Kansan, he seems to speak their language; and, like everyone else who knows him, Kansans seem to like him.

Starting with a BS degree from University of Kansas in 1940, he served in the Public Health Service during the war period, mostly in the Chicago Regional Office. After getting out of the service, he got his CE degree in 1947 and followed this up in 1948 with a MS degree in sanitary engineering from Harvard. He has been active in many engineering groups, including President of the Kansas Section ASCE; past chairman, Engineering Section, APHA; and member of the Kansas Engineering Society, of Tau Beta Pi and of Sigma Xi. He is also a member of the Joint Committee for the Advancement of Sanitary Engineering.

His hobbies are his family —Mrs. Metzler and three daughters, Linda, Brenda and Marilyn ("They keep me hopping")—and hunting, fishing, photography and occasional week-ends "back on the farm." In his spare time, he has written numerous technical articles (some have appeared in this magazine), reports and papers.

Are you tired of telephone complaints?

Then follow the lead of one water superintendent who turned complaints into compliments by using Calgon* Threshold Treatment. His telephone continued to ring, but with a difference. Satisfied users wanted to tell him how much they appreciated the clear water supply. No more red water complaints for him.

For Calgon not only stabilizes iron and manganese dissolved in the water at its source, but also prevents iron pickup from pipes . . . and presto! Red Water is stopped. Corrosion control with Calgon† greatly reduces tuberculation, keeps flows high and pumping costs low.

But that's not all . . . Calgon inhibits the formation of lime scale, in either naturally hard or lime softened water. The secret? Scale forming chemicals are kept in solution so filters, valves, mains and heaters stay clean and flow capacities are maintained.

Experienced Calgon engineers put years of experience with water problems of all types in every part of the country at your service. Call on Calgon for help with *your* water problems.

*Calgon is the Registered Trademark of Calgon, Inc. for its glassy phosphate (sodium hexametaphosphate) products.

†Fully licensed for use under U. S. Patent 2,337,856 and 2,304,850.

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Whatever the job . . . or season . . . or ground condition . . . it's CONTROLLED TRACTION (the exclusive combination of All-Wheel Drive and All-Wheel Steer) that licks 'em all.

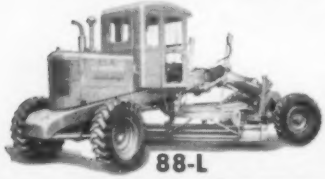
On Austin-Western Power Graders there are no idling front wheels — no dead front end to consume power and decrease efficiency. Every pound is working weight — contributing 100 per cent to traction and delivering maximum power where it counts — at the blade.

Driving, steerable wheels at the rear, teamed up with the live climbing power of Austin-Western's famous front truck, provide flotation and tractive effort ordinary motor graders cannot hope to equal.

Spring and Summer, Fall and Winter, A-W Power Graders outperform all others . . . on all types of work, and under all conditions. Torque Converter Drive — available in all models — makes these . . .

THE HOTTEST MOTOR GRADERS ON WHEELS

NOW THERE ARE FOUR *to meet your every need*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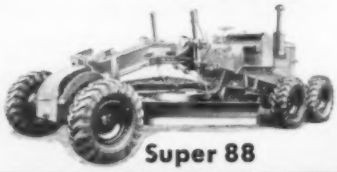
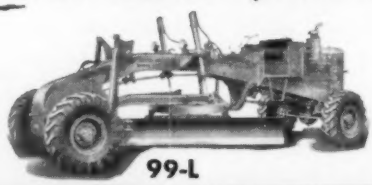

Super 88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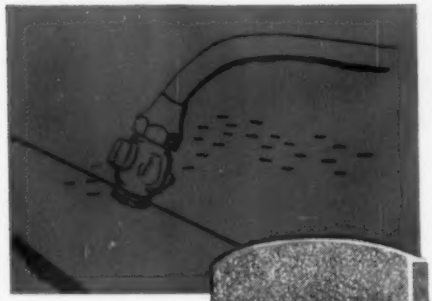
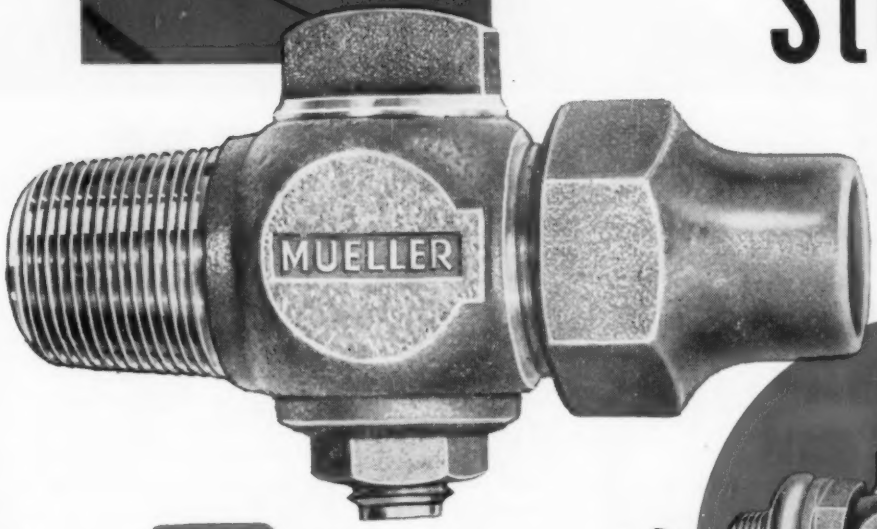


Corporation Stops



for Every need!

Regardless of the type of main, there is a Mueller Corporation Stop to fit your needs. A broad selection of inlet and outlet threads, including a compression joint inlet for thin-walled pipe, and many other special inlets and outlets are available for your specific requirements. The precision ground key is individually lapped into the body and air-tested under water for leakage. Both key and body are of Mueller Water Works Bronze. A heavy protective plastic coating covers all exposed threads, preventing thread damage caused by rough handling.

Mueller Corporation Stops can be inserted into the main under pressure with the Mueller "B" or "A-2" Tapping Machine.

Refer to your Mueller W-96 Catalog, consult your Mueller Representative or write direct for information on the Corporation Stop to fit YOUR need.

MUELLER CO.

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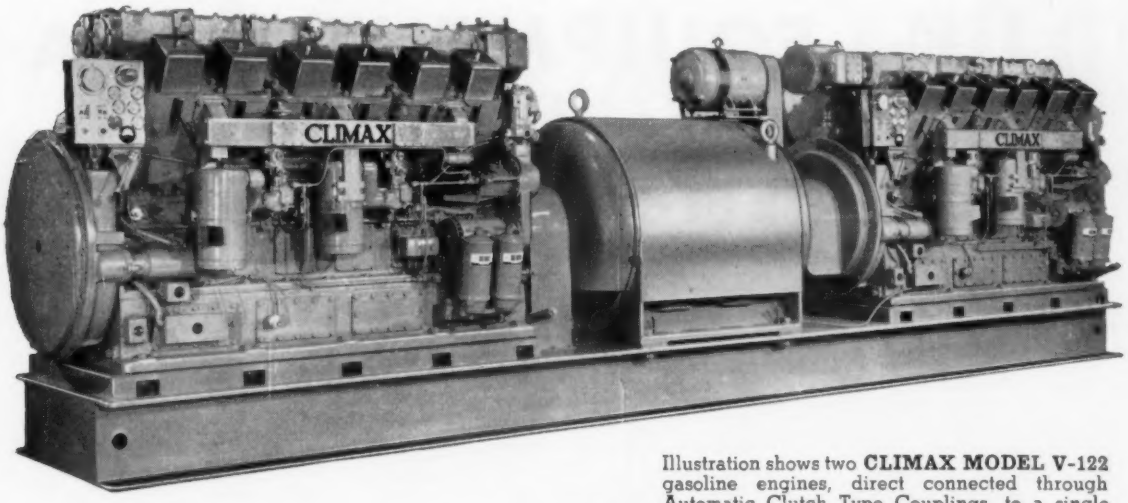


Illustration shows two **CLIMAX MODEL V-122** gasoline engines, direct connected through Automatic Clutch Type Couplings, to a single 625 KVA, 500KW, 1200 RPM, 3 phase, 60 cycle, 2400 volt AC Generator. This unit is installed in the **WASHINGTON TERRACE PUMPING STATION, ST. PETERSBURG, FLORIDA.**

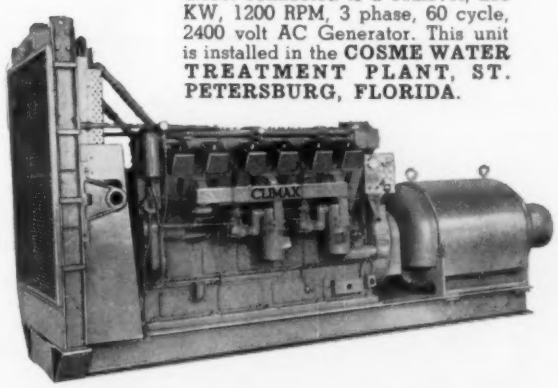
STANDBY PROTECTION WHEN YOUR POWER FAILS

In connection with the modernization and expansion of its Water Works System, the **CITY OF ST. PETERSBURG, FLORIDA** recently installed two Climax engine driven generator sets for use on a standby basis. The **TWO UNITS ILLUSTRATED** are used when normal sources of power are interrupted by tropical storms or mechanical failures.

Each of these generator sets is designed for instantaneous starting, and both are capable of supplying necessary power to operate the motor driven pumps.

Design and construction engineered by Greeley and Hansen, Chicago, Illinois.

Illustration shows one **CLIMAX MODEL V-122** gasoline engine, direct connected to a 312KVA, 250 KW, 1200 RPM, 3 phase, 60 cycle, 2400 volt AC Generator. This unit is installed in the **COSME WATER TREATMENT PLANT, ST. PETERSBURG, FLORIDA.**



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FREE EQUIPMENT DATA to Help Your PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the coupon, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field.

Complete Information on Aluminum Lighting Standards

53. A 24-page catalog on aluminum street lighting standards, flood lighting standards, traffic signal poles, pedestal lamp posts and accessories has just been released by Hubbard Aluminum Products Co., 6301 Butler St., Pittsburgh 1, Pa. High corrosion resistance, no painting or other maintenance, entire shaft is one piece and easy to install are some of the features. Check the coupon today.

Complete Bulletin On Municipal Supplies

24. Everything from leak locators to street signs is listed in the comprehensive Municipal and Industrial Catalog published by Sargent-Sowell, Inc. Hundreds of different items for all city departments are included in this convenient reference. Get your copy from Sargent-Sowell, Inc., Box 1176, Grand Prairie, Texas, by checking the coupon.

Automation Parking Pays Big Revenues

208. A bulletin explaining in detail how the WRRS electric parking gates operate by using coins, keys or tokens and how the gate can be installed to fill a variety of parking lot needs has just been offered by Western Railroad Supply Co., 2428 S. Ashland Avenue, Chicago 8, Ill. Check the coupon.

Catalog on Sewage Gas Meters, Regulators and Valves

245. A handy catalog on sewage gas meters, regulators and valves is available from Rockwell Mfg. Co., Pittsburgh 8, Pa., also included are data on lubricants and accessories, power and remote operation, semi-steel valves and multiport valves. Check the coupon.

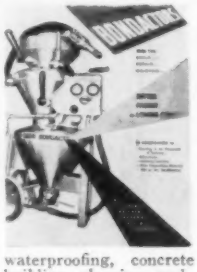
Technical Catalog on Gibbs Flotation Unit

367. A 20-page colored catalog describing the Gibbs Flotation Unit has just been released by F. S. Gibbs Inc., Newton 62, Mass. Complete information on what the unit is, where it is used, how it works, schematic flow diagrams and specifications are included. Check the handy coupon today for your copy.

Catalog on Instrumentation for Sewage Treatment Plants

436. Sewage Treatment Plant operators should have this catalog on instrumentation. Issued by Fischer & Porter Co., Hatboro, Pa., this catalog has plenty of flow sheets showing many of the instrument applications possible in either the trickling filter or activated sludge types of treatment systems. Check the coupon.

Information on "Bondactors" Concrete Gunning Machines



282. The "Bondactors" are concrete gunning machines that are capable of gunning cementitious aggregates by means of compressed air at a greater density, stronger bond and longer-lasting surface. Full details on models, specifications, accessories and extra accessories are included. Examples of these machines being used for waterproofing, concrete restoration, stuccoing, building cleaning and fireproofing are shown. For your literature send to Air Placement Equipment Co., 1009 W. 24th St., Kansas City 8, Mo., or check the handy coupon.

Valuable Catalog on Butterfly Valves

64. A catalog that includes basic engineering data which is complete enough to permit the user to accurately size the valves needed and a complete description of each valve, with specifications, layout drawings and dimensions of standard valves in each pressure rating are given. Get your copy from S. Morgan Smith Co., York, Pa., by checking the handy coupon.

Panels and Cubicles in Modern Water Conditioning Plants

393. Engineers dealing in water-conditioning problems or in utilization of ion exchange equipment, should have this bulletin that shows typical assemblies of conventional and graphic type cubicles and a number of installations in various industries and for applications which include power stations and municipalities. For your copy write to The Permutit Co., 330 W 42nd St., New York 36, N.Y., or check the coupon.

A Complete Street and Highway Traffic Sign Catalog

433. A fully illustrated, multicolor catalog that offers to states, counties and municipalities a complete selection of all standard or custom built markers in both flat or embossed steel has been issued by National Safety Engineers, Box 1069, Birmingham 1, Ala. Flat Aluminum baked enamel finish or reflectorized "Scotchlite" or "Prismo" signs are included. Check the coupon today.

MORE LISTINGS ON PAGES 34 TO 48

Catalog on the Towner Nu-Way Rubbish System

30. A new catalog describing the Towner Nu-Way rubbish system is available from the Towner Manufacturing Co., Santa Ana, Calif. Information on a twin boom front end loader, with container, loader dumping container and detachable container is included. Check the coupon.

Valuable Booklet on Aluminum Pipe

149. Aluminum pipe for conveying everything from air to acid is thoroughly described in a new 18-page booklet published by the Aluminum Co. of America, 770 Alcoa Bldg., Pittsburgh 19, Pa. The two-color booklet presents the pipe's characteristics and advantages for each of its fields of application. Specifications are provided, along with a description of appropriate fittings and methods of installation. Check the coupon today.

A Fully Rotary Compressor by Jaeger

209. Complete information is available from The Jaeger Machine Co., Columbus 16, Ohio on this 2-stage, oil-cooled rotary compressor. Features include 80% fewer moving parts, up to 30% less weight, vibrationless operation and 100° cooler air. For full details check the coupon.

Snow Plows for Tractors, Graders and Jeeps

207. An attractive four-page bulletin issued by Wm. Bros Boiler and Mfg. Co., Road Machinery Div., 1057 Tenth Ave., S.E., Minneapolis 14, Minn. describes rotary snow plows that are for the front-end loader mounted models for wheel-type tractors and jeeps. Complete specifications are given and also the cutting widths. For your copy check the coupon.

12-55

USE THIS COUPON to get detailed information on products and materials mentioned in this issue. Circle numbers below and mail today.

STOP READ AND SEND

Booklets from pages 32 to 48:

20 24 25 29 30 31 32 39 44 48
49 50 53 54 59 60 64 69 76 81
82 84 86 89 91 95 96 101 102 121
126 139 140 141 145 146 147 148 149 160
163 167 173 197 198 207 208 209 211 212
213 218 219 220 222 224 225 226 230 231
235 239 242 243 244 245 255 257 262 266
267 270 271 277 278 280 281 282 284 303
308 312 332 335 339 340 341 343 347 351
354 358 359 362 367 368 377 384 385 386
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New Products, pages 138 to 143

12-1 12-2 12-3 12-4 12-5 12-6 12-7
12-8 12-9 12-10 12-11 12-12 12-13 12-14
12-15 12-16 12-17 12-18 12-19 12-20 12-21
21-22

Name .....

Occupation .....

Street .....

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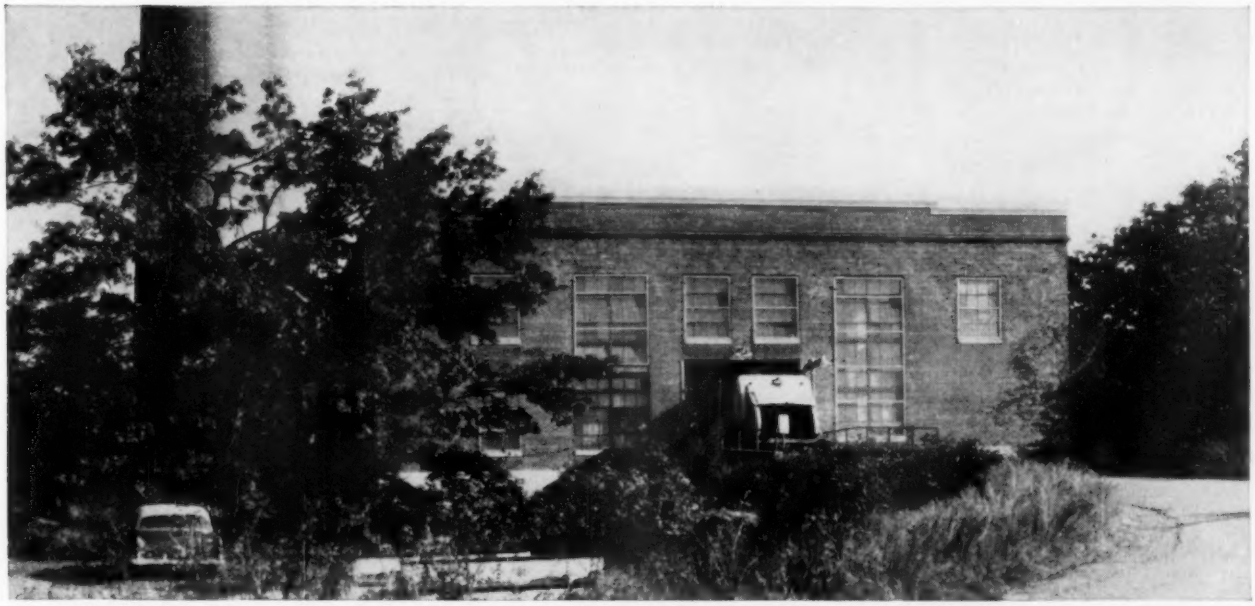
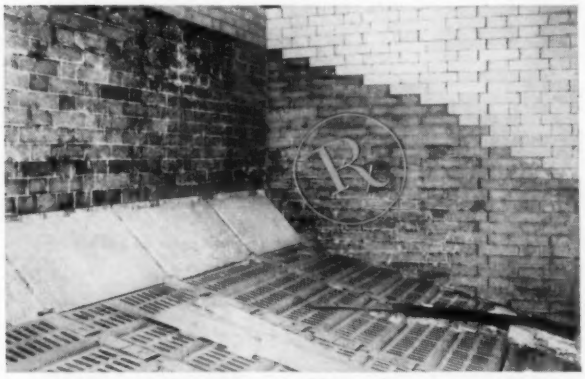
NOT GOOD AFTER JAN. 15, 1956 MAIL THIS CARD NOW

Another Norton Rx *on the job!*



The Newton, Mass., Municipal incinerator, recently modernized. General contractors: John F. Griffin Co., Cambridge. Refractory contractors: D. Antonellis, Inc., Brighton. CRYSTOLON *engineered and prescribed* refractories were specified.



Around the grate of the Newton incinerator, CRYSTOLON brick was installed in back and side walls, up to 3 feet above the sloping, movable grate.

CRYSTOLON brick was also used around the doors leading to grates, and for the front wall over the stoking door. Door arches and jambs are made of special CRYSTOLON shapes. Photo taken during installation.

Complete overhauling of Newton, Mass., incinerator includes extensive use of CRYSTOLON refractories to protect trouble-spots.*

In the modernization of old incinerator plants, just as in the building of new ones, the use of Norton *engineered and prescribed* refractories is the mark of up-to-the-minute construction methods.

For example, when the Newton incinerator was overhauled, CRYSTOLON refractories were the logical Rx's for various critical areas. The reason:

Exceptional resistance to slags, clinkers and abrasive refuse . . . ability to withstand temperatures up to 3050°F . . . great physical strength and resistance to thermal shock and chemical attack . . . up to 15 times the resistance of ordinary fire clay to erosion and corrosion . . . extra-long, trouble-free service life.

Investigate how these or other Norton refractory Rx's can save time, money and work in your own furnace operations. See your Norton Representative or write to NORTON COMPANY, 231 New Bond Street, Worcester 6, Mass. Canadian Representative: A. P. Green Fire Brick Co. Ltd., Toronto 5, Canada.

NORTON

REFRACTORIES

Engineered... Rx ...Prescribed

Making better products...to make your products better

*Trade-Mark Reg. U. S. Pat. Off. and Foreign Countries

Need more facts about advertised products? Mail your Readers' Service card now.

NEW LISTINGS (Cont.)

Valuable Information On New Parking Barrier

312. Park cars, trucks and busses without fear of damaging fences, buildings and other vehicles in the parking lot by using the Har-Bar. Full details on this parking barrier are available from Harris-Barrier, Inc., 916 East 23rd St., Indianapolis, Ind. Complete specifications, features and parking lot designs are included. Check the coupon today for your literature.

Elimination of Corrosion Problems With Saran Pipe

384. A catalog describing Saran pipe and tubing on its outstanding properties, data on where to use it, how to weld it and thread it on standard equipment has been released by The Dow Chemical Co., Midland, Mich. Information on the ease of handling, size, weights and bursting pressures are furnished. Check the handy coupon.

Bringing Modern Street Lighting to Your Community

141. A 22-page catalog entitled "Light the Way for a Better Community" has just been issued by General Electric Co., Schenectady, N. Y. This catalog suggests how greatly your community will benefit from relighting and demonstrates the importance of a lighting survey and a carefully fully engineered planned-lighting proposal. For full details check the coupon.

Semi-Automatic and Step Control Chlorine Feeding

160. A bulletin, complete with photographs and typical installation and control arrangement diagrams has just been released by Builders-Providence, Inc., Div. of B-I-F Industries, Inc., Providence, R. I. Applications where semi-automatic and step control chlorine feeding are used and the main advantages are included. For your copy check the coupon.

A New Pipe Finding Manual

213. A new manual of special pipe finding and leak detecting techniques of interest to utilities, municipalities, oil and gas companies is announced by Fisher Research Laboratory, Inc., 1961 University Ave., Palo Alto, Calif. The manual contains a number of articles on locating buried pipes and cables and detecting and locating fluid leaks in pipe lines. Check the coupon for your free copy.

A Parking Meter that Answers Your Parking Problems

218. A manual parking meter is fully described in literature available from the Voglesong Products Corp., Turrent Parking Meters, Emeryville 8, Calif. The Turrent parking meter is operated by a simple easy turn of the handle through an arc of 120° with no cranking or winding involved. For full details check the coupon.

Valuable Information on Semi-Automatic Auto-Garage

226. Literature on the new P & H auto-garage, which is semi-automatic and can handle from 100 to 296 cars in a single unit ten stories high, is available from Harnischfeger Corp., Milwaukee 46, Wisc. Full details on the sq. ft. needed per stall, minimum frontage requirements, method of car park and depark and location and type of controls are included. For complete information check the coupon.

T-Lock Amer-Plate Sewer Lining

231. A new illustrated two-color brochure describing T-Lock Amer-Plate, the continuous plastic sewer lining, has just been published by Amercoat Corp., 4809 Firestone Blvd., South Gate, Calif. The brochure contains photographs of the T-Lock Amer-Plate and complete information on its composition, physical and chemical properties, and the method of incorporating the lining in pre-cast and cast-in-place concrete sewer pipe and structures. Check the coupon for full details.

New Carter Rotary Actuator

244. A rotary actuator that transforms reciprocating cylinder action into rotary motion is fully described in literature from Carter Controls, Inc., 2800 Bernice Roads, Lansing, Illinois. It is possible to stop action and hold at various points in the rotation cycle with this actuator and it may be powered with air, gas, water and fluids of all kinds. Check the coupon today.

Hydro Power Sweeper Completely Operated By Hydraulics

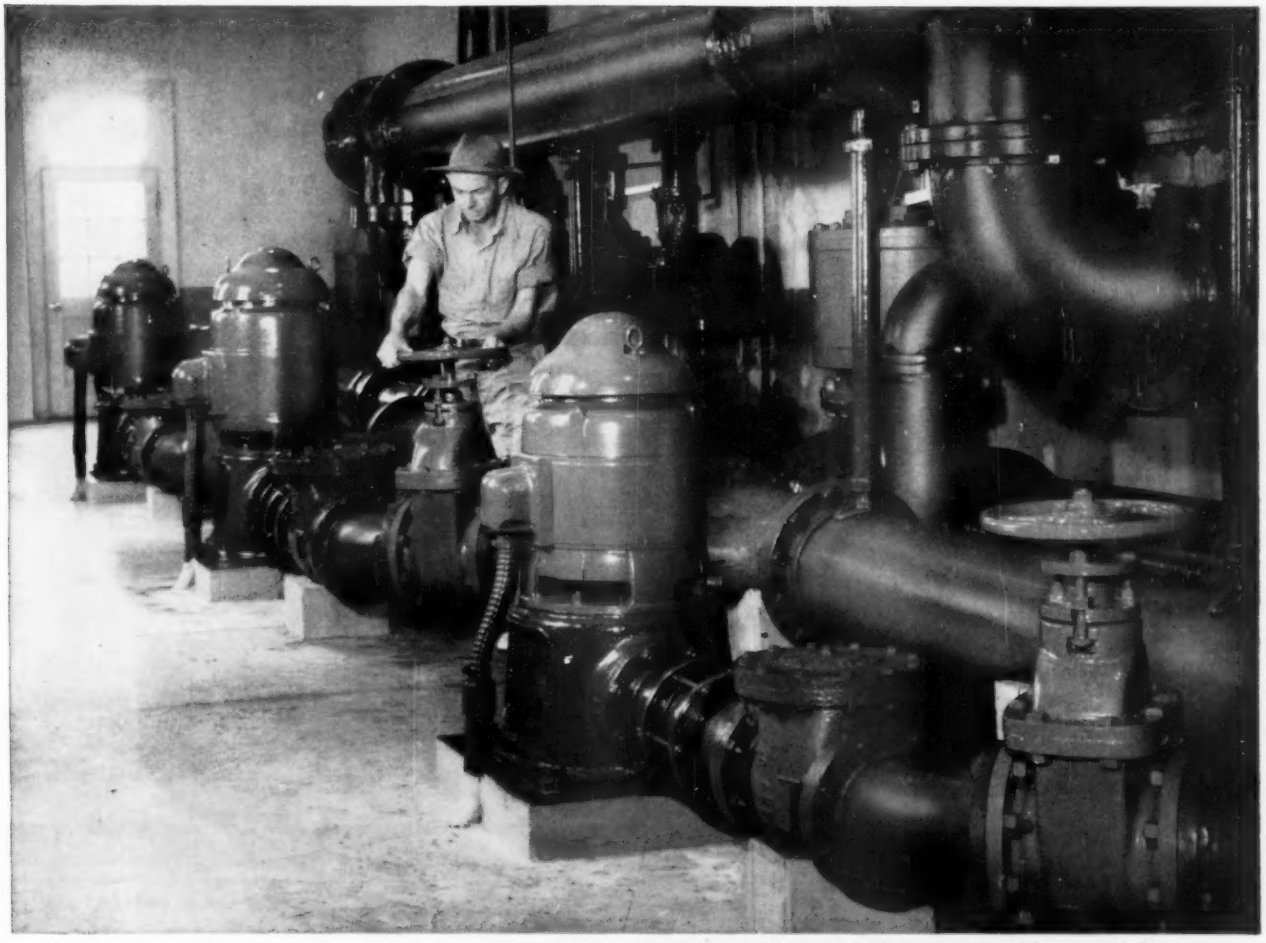
262. A sweeper that is designed for driver comfort by being completely operated by hydraulics is described in literature just released by Hydro Power Street Sweeper Corp., 17833 So. Main St., Gardena, Calif. Gutter and rear broom, elevator, dumping, water and hydraulic system and maneuverability are fully outlined. Check the coupon today.

Engineering Data on Micro-straining for Clarification of Water Supplies

443. Micro-straining by use of specially woven metallic fabrics clarifies liquids by removal of microscopic-sized suspended solids. A complete discussion of this process and its applications is covered in a 24-page "Micro-Straining Plant" booklet of Glenfield & Kennedy, Inc., 677 Fifth Ave., New York 22, N. Y. Check the coupon for your copy.

How to Design Chemical Feed Systems

444. In a 12-page booklet published by Proportioneers, the many factors which enter into the design of a chemical feed system are discussed, and the types of systems used described in detail. These include dry feed, both volumetric and gravimetric and solution feed of the decanter and positive displacement pump types. Feeder controls are considered in detail. Send now for File No. RP-9080 by checking coupon. Proportioneers, Inc., Providence 1, R. I.



THREE WORTHINGTON VERTICAL TURBINE PUMPS lift water 66 feet in the dual-purpose water treatment plant in Pulaski, Virginia.

Pulaski's new plant softens hard water, hardens soft water

Seems that the main source of water for Pulaski, Virginia, is a small impounding reservoir where the water is extremely soft.

When the reservoir runs low, Pulaski draws from a limestone spring. Water here is unusually hard.

To deliver water of uniform quality all year 'round, the Pulaski plant has to soften the hard water — and harden the soft water.

Pumps for this unique plant were supplied by Worthington. Three Worthington vertical turbine units transfer water from the plant's clear well to the general distribution system. Pulaski's engineers are well pleased with the Worthingtons because they take up so little floor space and need no priming facilities or foot valves. The three pumps are installed in a 16-foot deep clear well and lift water 66 feet at exceptionally high pumping efficiencies.

Why not learn how the modern Worthington vertical turbine pump can help in your operation? Write for free Bulletin W-450-B40 to Worthington Corporation, Vertical Turbine Pump Division, Harrison, New Jersey. D.4.28

WORTHINGTON

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

CENTRIFUGAL • ROTARY • STEAM • POWER • VERTICAL TURBINE

CONSERVE GROUND WATER—IT IS A VALUABLE RESOURCE

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

To order these helpful booklets check the coupon on page 32.

AMERICA'S LARGEST LINE OF PIPE CLEANING TOOLS AND EQUIPMENT

SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay underdrain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works 200 So. Broad St., Ridgewood, N. J. Check the coupon and we will forward your request.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete, easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible, Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included. Check the coupon for your copy of this helpful handbook.

Helpful Design Data For Sewage Ejectors

81. The application and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking coupon.

Digester Capacity Requirements Are Substantially Reduced

204. A 16-page, two-color bulletin, "The Dorrco Densludge Digestion System" is now available from the Dorr-Oliver, Inc., Barry Place, Stamford, Conn. Describes the development, equipment, operation, typical applications and design loadings of this new sludge digestion system. Explains how digester capacity requirements are substantially reduced. Included are wash and line drawings and photographs of the various equipment units. Check the coupon.

Theory and Application Of the Flow Tube

84. Hydraulic formulae, head capacity curves and test data for this primary metering element are given in a technical bulletin, "Theory and Application of the Flow Tube," available from Foster Engineering Co., Union, N. J. Check the coupon for a copy.

A Pressure Proven Joint for Concerte Pipe

335. Investigate the Amseal Joint on low pressure concrete pipe for intercepting sewers, inverted syphons, sewage force mains and low pressure water supply lines. This folder is published by American-Marietta Company, Concrete Products Division, 101 East Ontario St., Chicago 11, Illinois. Describes concrete pipe for use in sewer and water lines where maximum operating pressure will not exced 50 psi. Check the coupon today.

Engineering Data on Gas Safety Equipment

343. P.F.T. Gas Safety Equipment for Controlled Digestion is the subject of an excellent 12-page bulletin issued by Pacific Flush Tank Co., Chicago 13, Ill. Full engineering data on flame traps, pressure releases, waste gas burners and related equipment is provided in convenient form. Requests for this valuable booklet must be made on business letterhead.

Combat Unpleasant Odors At Municipal Sanitation Sites

404. Malodors at municipal refuse disposal sites, waste treatment plants and incinerators may, be effectively "neutralized" by the odor masking products of Rhodia, Inc. Be sure to investigate this means of eliminating complaints from unpleasant odors. Write Rhodia, Inc., 230 Park Ave., New York 17, N. Y. or check the coupon.

Design and Applications of the Spiragester

419. The Spiragester is a combination of a clarifier and a digester in a single unit, compactly arranged for economical construction and ease of operation. Full data on operation, explicit design information and specifications are included in Bulletin 135, issued by Lakeside Engineering Corp., 222 West Adams, Chicago, Ill. Check the coupon for a copy.

Complete Information and Installation Data on Clay Pipe

225. A fully illustrated bulletin containing complete data on vitrified clay pipe with pre-assembled Tylox flexible couplings has just been released by Universal Sewer Pipe Corporation, 1500 Union Commerce Building, Cleveland 14, Ohio. Complete information on Universal's rubber, neoprene and polyvinyl chlorid resin types of Tylox couplings is included Check the coupon today.

Efficient Underdrains for Rapid Sand Filters

239. Be sure you have engineering data on vitrified clay underdrains, efficiently designed for filtering and backwashing. Check the coupon or write F. B. Leopold Co., Inc., Dept. PW, 2413 W. Carlson St., Pittsburgh 4, Pa.

Helpful Data on Bermico Pipe Fittings

280. Data are now available on fittings for use with Bermico sewer pipe and perforated pipe—T's, Y's and bonds—in sizes and combinations not previously available. These make complete root-proof, water tight, corrosion-resistant Bermico pipe systems. Get full information by checking the coupon. Brown Co., 150 Causeway St., Boston, Mass.

Tables Simplify Selection of "Flush Kleen" Sewage Ejectors

386. "Flush Kleen" selection is made easy by a series of engineering tables offered in Bulletin 123 by the Chicago Pump Co., 622 Diversey Pkwy., Chicago 14, Ill. Station types, flow determination, pump capacity and procedures for determining total dynamic discharge heads are outlined in detail. Get this useful reference by checking the coupon.

Solids Pump Uses Recessed Impeller

428. The Wemco "Torque-Flow" solids pump works with a completely recessed impeller which creates a vortex effect and transmits power exactly as in a fluid type torque converter. This avoids flow through impeller vanes and reduces clogging difficulties when handling sewage sludge or abrasive materials. For full details, get Bulletin SP-10 by writing to Western Machinery Co., 760 Folsom St., San Francisco, Calif., or check the coupon.

STACKS UP BEST
for water treatment

For over twenty-five years, HTH Granular has proved its economy in maintaining effective sanitation in a variety of water treatment applications. Containing not less than 70% available chlorine, HTH Granular provides a readily available source of hypochlorite for:

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Get full details of this month's products . . . mail your Readers' Service card today.

To order these helpful booklets check the coupon on page 32.

Design Data on Chemical Flocculating Equipment

89. Flash mixers, Straightline mixers, conveyors and elevators for handling chemicals are described in illustrated Bulletin No. 2442 available from Link-Belt Co., Colmar, Pa. Selection tables and diagrams are provided to help you select the equipment best suited to your needs. Check the coupon for your copy.

Mechanical Joint Principle Applied to Sewer Pipe

101. The Amvit joint forms a tight compression seal between bell and spigot rings, prevents infiltration and stops root intrusion. Get data on Amvit jointed vitrified clay pipe from American Vitrified Products Co., Cleveland, Ohio.

Getting Improved Sludge Dewatering With Non-Clogging Vacuum Filters

425. Latest information on the Komline-Sanderson "Coilfilter", which features non-clogging, permanent filter media to obtain constant output and low operating cost is presented in illustrated Bulletin No. 102 by the Komline-Sanderson Engineering Corp., Peapack, N. J. Be sure to investigate this improved method of sludge dewatering. Check the coupon today.

STREETS AND HIGHWAYS

Levels Sidewalks and Curbs Quickly and Easily

29. How the Mud-Jack Method for raising concrete curb, gutter, walks and streets solves problems of that kind quickly and economically without the usual cost of time-consuming reconstruction activities—a bulletin by Koehring Company, 3026 W. Concordia Ave., Milwaukee 16, Wis. Check the coupon.

Useful Attachments for "Payloader" Tractor Shovels

95. Increased versatility for Hough "Payloader" tractor shovels is made possible by the various attachments described in literature of the Frank G. Hough Co., 761 Seventh St., Libertyville, Ill. Illustrated and described are rotary "V" and trip-blade snow plows, hydraulic backhoe, back-filler blade, pickup sweeper, scarifier teeth, winches, etc. Check the coupon today and full details will be sent.

Grading Can Be Faster, Cheaper and Easier

96. You'll like every feature of the Austin-Western 99H Grader. It has all-wheel drive, all-wheel steer, controlled traction, precision sideshift and a high lift, extreme reach, reversible blade. Get data from Austin-Western Co., Aurora, Ill.

Trenching Equipment Data Conveniently Assembled

212. The entire line of Cleveland trenching and backfilling equipment is now covered in a single bulletin, with material arranged for quick comparison of capacities, specifications and dimensions of all models. Twenty-four action photos graphically illustrate various job applications. Get Bulletin S-120 now for easy review of your trenching equipment needs. Just check the coupon or write to the Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

Bitumuls for Surface Course Mixes

409. New 12-page bulletin describes and illustrates the uses of Bitumuls emulsified asphalt for rapid mixing with economical aggregates in the construction of durable pavements. The bulletin covers typical Bitumuls applications in all parts of the country and a description of laboratory service for proper analysis of aggregates. Copies may be obtained by writing American Bitumuls & Asphalt Co., 200 Bush Street, San Francisco 11, Calif., or check the coupon.

1,001 Profitable Uses For Holmes-Owen Loader

39. The addition of a Holmes-Owen Loader to your dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy coupon for full data. Ernest Holmes Co., Chattanooga, Tenn.

A Highly Active and Potentially Useful Algicide

354. Tests of Dichlone, the active ingredient of Phygon-xl, shows it to be a most effective chemical for killing blue-green algae in lakes and ponds. A report on the results of these tests and usage and availability of this algicide can be furnished by Naugatuck Chemical Div., Bethany 15, Conn., or by checking the coupon.

For Prompt Service Use The Coupon

Go-Anywhere Transportation Provided by the "Jeep" Family

377. A new booklet which graphically portrays the wide range of uses of "Jeep" vehicles in public service is now available from Willys Motors, Inc., Toledo 1, Ohio. Specifications, special equipment, accessories and plenty of photographs of the jeep in action are included. Just check the coupon for your copy.

Valuable Information On Aerial Surveys

437. What you should know about aerial surveys is described in detail in the latest literature just released by Alster and Associates, 6135 Kansas Ave., Northeast, Washington 11, D. C. Topographic maps, mosaics and planimetric maps by aerial photograph are fully illustrated. For more information check the handy coupon.

To order these helpful booklets check the coupon on page 32.

Give Full Protection To Treated Poles and Timbers

267. Bolt holes in treated poles and timbers used for guard rails and structures can easily be the first point of decay. Now you can assure maximum life by using the Greenlee Bolt Hole Treater, a simple device that forces preservative into the wood cells. Bulletin 13-15 gives the details. Greenlee Bros. & Co., Rockford, Ill.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem reduce troublesome brush and trimmings to tiny, easy-to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16-page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass., or check the coupon for your copy

What You Should Know About Soil Sampling

255. Acker Soil Sampling Catalog No. 25 contains a complete and thorough collection of information about soil sampling in all types of sub-surface conditions. Modern sampling techniques are discussed together with recommendations as to tools and accessories. Write Acker Drill Co., Inc., Scranton, Pa., or check the coupon.

Better Drainage for Streets and Highways

358. Irving "Dryway" Draingrates provide maximum drainage openings for catch basin inlets, across-the-road drains and center-line drains. Light weight, strength, economy and corrosion resistance are a few of the many features offered. Full descriptive details on both riveted and pressure locked type are furnished in an illustrated bulletin by Irving Subway Grating Co., Inc., 50-53 27th St., Long Island City 1, N. Y. Check the coupon.

Galion 503 Tandem Drive Economy Grader

145. A sixteen-page catalog #380 has just been released by The Galion Iron Works & Mfg. Company, Galion, Ohio, describing the numerous construction and operating features of the Galion Model 503 Motor Grader. Optional equipment includes hydraulic shiftable moldboard, front-end scarifier, "V" and straight snow plows, rear-end bucket loader and bulldozer. Check the coupon.

Be Sure to Investigate These Parking Meter Features

146. Parking meters designed for greater public convenience, unlimited flexibility with easy adjustment of time limit rate and coin acceptance plus simplified enforcement inspection are described in the attractive bulletin of Magee-Hale Park-O-Meter Co., Commerce Exchange Bldg., Oklahoma City 2, Okla. Get all details on the Model H meter by checking the coupon.

CONSTRUCTION EQUIPMENT AND MATERIALS

Inexpensive Ditcher Handles Heavy Digging

91. The Shawnee Scout Ditcher, a new heavier model for extensive digging has been added to the Shawnee line of ditchers and dozers. All models are designed to handle ditching and backfilling operations quickly, efficiently and at low cost. Full information on this equipment will be sent by Shawnee Mfg. Co., 1947 N. Topeka, Topeka, Kansas. Just check the coupon.

Streamlined Data on Tractors, Scrapers and Power Units

102. The complete line of International Industrial Power products, 73 in all, is described in a new 48-page catalog just published by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. Technical data has been streamlined, yet provides abundant descriptive material on each piece of equipment. Check the coupon for the latest on crawler and wheel tractors, scrapers, dozers and related attachments plus International Diesel, gasoline and gas power units.

A Tractor-Air Compressor Unit

140. "Around the Clock, Around the World" is the title of an 8-page bulletin describing Le Roi's new 125 Tractair, a self-propelled compressor unit with flexible tractor power. Applications, uses, attachments and tools, design and specifications of the compressor and engine are listed. Write Le Roi Division of Westinghouse Air Brake Company 1706 South 68, Milwaukee 14, Wisconsin, or check the coupon for your copy.

Check List for Successful Earthmoving Bids

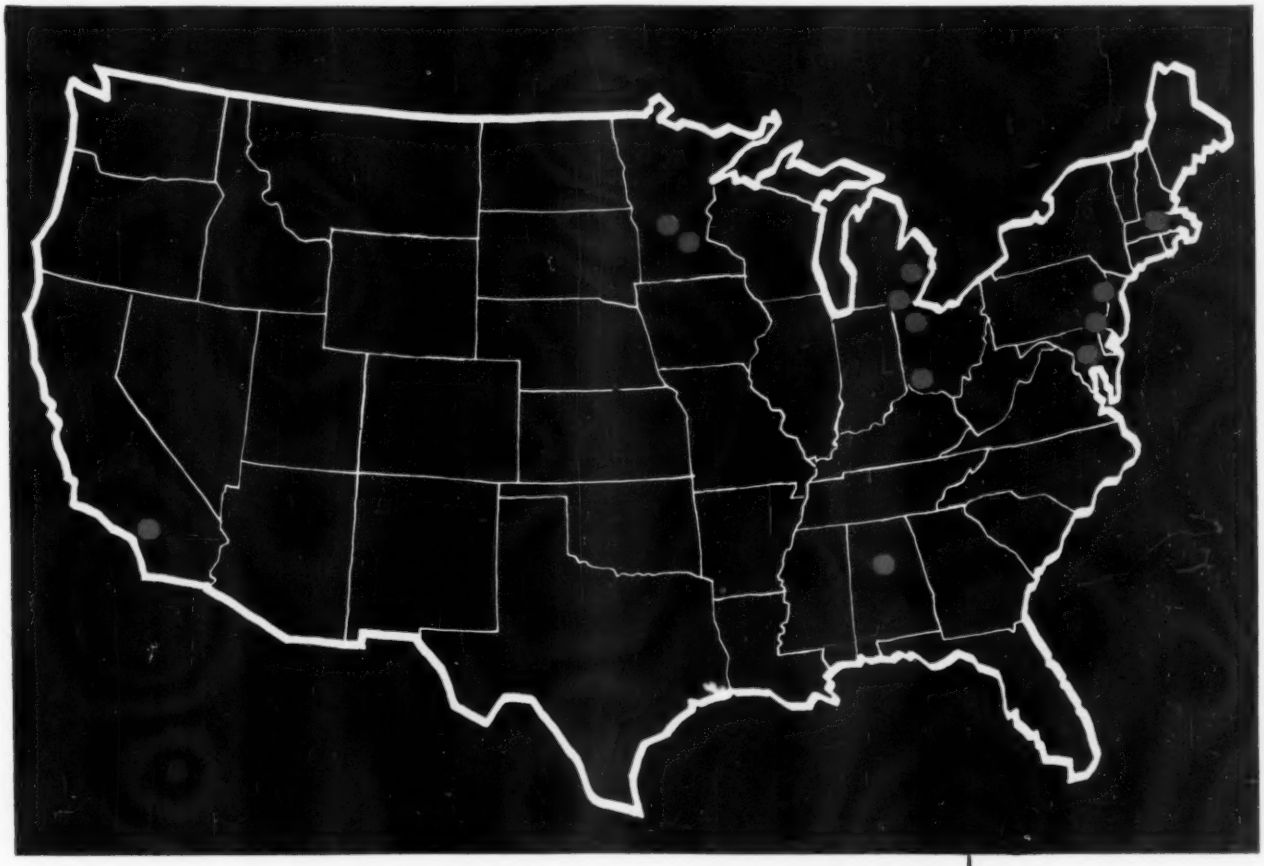
147. Valuable information for the earthmoving contractor and for the engineer who must estimate earthmoving costs is provided in a new two-color illustrated booklet issued by Caterpillar Tractor Co., Peoria, Ill. A convenient check list is included to help select the proper equipment for the job. Check the coupon to get Form No. DE502.

Now Every Municipality Can Own a Trencher

173. The low cost of the Blackhawk Trench Hog, a tractor-mounted ladder type trencher makes it profitable for many municipalities to own their own trencher. Be sure to investigate this versatile machine which digs trenches to 8 feet deep, 20 inches wide. Illustrated bulletin available from Arps Corp., New Holstein, Wis. Just check the coupon.

Get Data Now on This Catch Basin Cleaner

198. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit Netco Div., Clarke-Wilcox Co., 118 Western Ave., Boston 34, Mass.



End rust, cut costs with ready-to-erect signs of Alcoa® Aluminum

You don't have to operate your own production facilities to gain the advantages of Alcoa Aluminum in traffic signs. Twelve leading manufacturers, serving every section of the country, can fill your requirements with finished signs, all ready to erect.

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Aluminum Company of America, 1978-M
Alcoa Building, Pittsburgh 19, Pa.

Your Guide to Aluminum Value

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These manufacturers sell finished signs of Alcoa Aluminum

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California Metal Enameling Co.
6904 East Slauson Avenue
Los Angeles 22, California

Cataphote Corporation
958 Wall Street
Toledo, Ohio

The Grote Manufacturing Co., Inc.
500 Lafayette Avenue
Bellevue, Kentucky

The Hunt Company
3700 W. Six Mile Road
Detroit 21, Michigan

Lyle Signs, Inc.
2720 University Ave., S.E.
Minneapolis 14, Minnesota

Minnesota Mining & Manufacturing Co.
900 Fauquier Avenue
St. Paul, Minnesota

Mulholland-Harper Co.
5820 Tacony St.
Philadelphia, Pa.

National Safety Engineers, Inc.
3910 First Ave., South
Birmingham, Alabama

Standard Sign & Signal Co.
470 Main Street
Clinton, Massachusetts

Traffic & Street Sign Company
80 Foundry Street
Newark, New Jersey

U. S. Standard Sign Company
P. O. Box 39 Station C
Toledo, Ohio

To order these helpful booklets check the coupon on page 32.

Handbook of Castings For All Public Works Construction

220. Every type of construction casting needed by engineers and contractors in the public works field will be found in a 136-page catalog issued by Neenah Foundry Co., Neenah, Wis. Detailed illustrations and complete tables of dimensions will help the designer and materials buyer. Get your copy of this valuable catalog by checking the coupon today.

The Modern Approach to the Brush Problem

222. Eliminate your brush disposal problem by using an Asplundh Chipper. For complete information on what the Chipper can do, how it can save on costs, various types available and other outstanding features write to Asplundh Chipper Co., 505 York Road, Jenkintown, Pa., or check the coupon.

Helpful Data On Pipe Tools

230. Toledo drop head ratchet threaders are light, compact, ideally suited for work in tight corners. Three models for ⅛" to ¾"; ⅛" to 1¼"; and ½" to 2" pipe all feature quick change of sizes. Get Catalog No. 25 from Toledo Pipe Threading Machine Co., Toledo, Ohio. Check the coupon.

Complete Protection Of Iron and Steel Products

242. What are the advantages of Hot-Dip Galvanizing? Why does it offer complete protection at such an economical cost? You'll find the answers in the attractive booklet "Stop Rust", which gives you the full story of the process plus a comprehensive coating comparison chart. Get your copy promptly by checking the coupon or write American Hot-Dip Galvanizers Assn., Inc., 1st National Bank Bldg., Pittsburgh 22, Pa.

Power Shovel, Crane and Backhoe All in One Unit

441. A completely hydraulic backhoe, shovel loader and crane all in one unit is described in literature available from the Badger Machine Co., Winona, Minn. Also, information on front-end loaders and other attachments that are useful for contractors, municipal and county engineers and state highway engineers. Check the coupon.

Booklet Helps Design of Custom-Engineered Steel Buildings

271. Custom-engineered Butler steel buildings are available in every size, type and design to meet your building needs. In a helpful 32-page booklet you will find details on several basic designs and an unlimited variety of door, window and interior treatments; answers to your questions on construction and erection; and many illustrations of typical uses. Use the coupon or write to Butler Mfg. Co., Kansas City, Mo.

Small Tractor Has Countless Uses

308. The "Agricat" tractor provides a small, powerful unit that can be used on lots of jobs. Tight spots are no obstacle. Attachments for dozing, snow plowing, loading. Full data available from Earl H. Pence & Co., Inc., 2150 Washington Ave., San Leandro, Calif. Check the coupon today.

Information on Two New Allis-Chalmers Tractors

340. For full details on more performance, versatility and dependability in a 45-drawbar-hp tractor get the new bulletin on Allis-Chalmers' two new HD-6 series tractors. Included is information on extra clutch life—with ceramic lining, power, strength and protection, new design and other features. Send to Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin, or check the coupon.

Economical Scraper Handles Many Heavy Jobs

398. Among the many applications of the versatile Model D Tournapull are: grading and building roads; handling garbage disposal, and grading, leveling and terracing. For details on how its speed, power and ability to work either as a self-loading tool can help your production and lower your costs, write Le Tourneau-Westinghouse Co., Peoria, Ill., or check the coupon.

STREET LIGHTING AND TRAFFIC CONTROL

Investigate These Street Lighting Standards

54. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards, brackets and mast arms by using the handy coupon. Check these strong, well designed, inexpensive steel standards for practical street and highway lighting. Handsome 26-page folder includes data sheets on floodlighting and area lighting applications. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn.

How Electro-Matic Controllers Solve Problem of Congested Intersections

60. Traffic control system regulated by Electro-Matic Controllers continually adjusts to changing traffic patterns to clear traffic faster and relieve the problem of congested intersections. Be sure to investigate this method of expediting traffic flow at difficult intersections. Get full data from Automatic Signal Div., Eastern Industries, Inc., East Norwalk, Conn. Just check the handy coupon.

Convenient Data on Traffic Signs and Markers

126. A complete line of traffic control devices, including stop signs, warning, signs, regulatory signs and danger signals is presented in the fully-illustrated catalog of the Grote Mfg. Co., Bellevue, Ky. Helpful excerpts from the "Manual on Uniform Traffic Control Devices for Streets and Highways" are included. Get a copy by checking the coupon.

Street Lighting Application Curve Eliminates Calculations

257. An easy-to-use chart from which illumination level, spacing and proper mounting height can be determined has been prepared by the Illuminating Engineering Laboratory, General Electric Co., West Lynn 3, Mass. For a copy of the chart and instructions on its use check the handy coupon.

To order these helpful booklets check the coupon on page 32.

WATER WORKS

Elevated Tanks and Other Storage Facilities

32. How engineers' designs and standard AWWA specifications are followed for fabrica- described in color illustrated booklet. Address the Darby Corp., Kansas City, Kans., or use the handy coupon.

Technical Data on Fluorides And Other Chemicals

48. Technical data on fluorides and other chemicals will be found in a comprehensive booklet issued by Blockson Chemical Co., Joliet, Ill. This helpful 60-page booklet includes a great deal of general information of value to water works men. Get a copy by checking the coupon.

Engineering Information and Water Distribution Products

49. Helpful engineering information, covering water distribution problems, is available from Mueller Company in their W-96 Water Works Catalog. The 328 page catalog features a quick reference sectional indexing arrangement for easy location and identification of the hundreds of water distribution and service products illustrated. Check the coupon and you will receive detailed information on a complete line of water works equipment.

Meter Features That Help Make Water Works Profitable

59. Simple design, accuracy and long life, moderate first cost and inexpensive maintenance are features of American water meters described in Bulletin No. 55 of the Buffalo Meter Co., 2917 Main St., Buffalo 14, N. Y. Be sure you have this informative booklet which gives the details of American meter design and construction plus full data on sizes, capacities and dimensions. Get your copy by checking the coupon.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal, control of certain tastes and odors, plus other aids in high quality water production. Check coupon for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

76. An 80-page manual, issued by R. D. Wood Co, Independence Sq., Philadelphia 5, Pa., presents specifications for "Sand-Spun" cast from pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews fire hydrant and R. D Wood gate valves. Check the coupon for this useful information.

Motor Units for Valves Floorstands and Sluice Gates

82. Complete information on Chapman motor units is available in catalog No. 51 from The Chapman Valve Manufacturing Co., Indian Orchard, Mass. Advantages, installation and operation are fully described. For more details on these units check the coupon today.

Vertical Turbine Pumps For Municipal Water Supply

121. Engineering data on vertical turbine pumps for deep or shallow well operation in capacities ranging from 50 to 10,000 gallons per minute, oil or water lubricated, are covered in a booklet issued by Worthington Corp., Vertical Turbine Division, Succasunna, N. J. Check the coupon today for this helpful information.

Engineering Data on Diatomite Filters

139. Get complete data on the Sparkler model SC-J diatomite slurry feed filter for swimming pools from the Sparkler Mfg. Co., Mundelein, Ill. Check the coupon for full information including table of filter sizes and capacities, space required and filter operation.

What You Should Know About The Centriline Process

197. The Centriline method for cement mortar lining water mains 16" thru 144" in place to stop leaks, prevent corrosion, increase carrying capacity and decrease pumping costs is fully described in a handsome booklet issued by the Centriline Corp., 140 Cedar St., New York 6, N. Y. Many illustrations and typical case histories show the operation and economies of this process. The Tate process for lining smaller mains is also covered. Check coupon for your copy.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the coupon.

New Bulletin Covers Current Darling Line

235. The latest product developments as well as all equipment items produced by Darling Valve & Manufacturing Co., Williamsport, Penna. for water works services are covered in 48-page Bulletin #5403. Complete data on ball bearing-operated fire hydrant, including detailed design and operating features, range of types, components, accessories, dimensions and installation and maintenance data are given. Check the coupon today.

Engineering Data on Control Systems For Filtration Plants

270. A 12-page bulletin No. MSA 127 offered by the Hagan Corporation, Pittsburgh 30, Pennsylvania, gives complete details on control and meter components for measuring and controlling such factors as rate of flow, loss of head, filter washing, chemical feeding, settling basin and clearwell level in filtration plants. Diagrams and photographs of control and metering systems are included. Check the coupon for your copy of this valuable bulletin.

Making Time on the N.Y. Thruway!

Le Roi 600 cfm compressor and Cleveland T-286 drill rig speed drilling operation

Motorists aren't the only ones who travel fast on the N. Y. Thruway. Contractors had to make plenty of time, too.

That's why this contractor made a mobile drilling unit out of his D-8 Cat. He used as components a Le Roi 600 CTM compressor and the Cleveland T-286 drill rig.

The compressor is designed especially for use with D-8 or TD-24 tractors. It is the only unit that attaches directly to the PTO and has a clutch as well. Capacity of the unit is 600 cfm.

The T-286 drill rig consists of two Cleveland patented air feeds, and Cleveland 4" drifters with air-motor booms. Here, it is mounted on the front of the tractor and has a spread of 220 degrees suitable for any variable drill pattern. Ten-foot steel changes, faster set-ups, better hole spacing, greater footage, better fragmentation—mean faster drilling and lower costs.

If you want to make time and cut costs on your rock jobs—just put an old tractor to work this way. Write us for literature that tells how.

LE ROI *Division of Westinghouse Air Brake Co.*

Milwaukee 1, Wisconsin


PORTABLE AIR COMPRESSORS


TRACTAIR


STATIONARY AIR COMPRESSORS


AIR TOOLS


ENGINES

C-159

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To order these helpful booklets check the coupon on page 32.

Restoration and Protection Of Concrete Structures

385. A "How to Do It" bulletin describing the Thoro System for repair and sealing interior and exterior masonry surfaces is available from Standard Dry Wall Products, Inc., New Eagle, Pa. The treatment for every water problem is presented in illustrated case histories in this useful publication. Check the coupon for your copy.

What You Should Know About Hypochlorination

395. "Hypochlorination of Water" is the name of an informative publication issued by Olin Mathieson Chemical Corp., Industrial Chemicals Div., Baltimore 3, Md. In it there is a discussion of chlorination theory, practice and equipment; control of algae, tastes and odors; and laboratory testing. Check the coupon for this interesting literature.

Helpful Engineering Data on Cast Iron Pipe

422. Complete data on McWane Super-DeLavaud centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long. Check the coupon for your copy.

How Your Filter Washing Can Be Improved

368. More effective sand washing with elimination of mud balls and bed cracking with resultant longer filter runs are claimed for the Palmer Filter Bed Agitator, described in bulletins issued by Palmer Filter Equipment Co., Erie, Pa. Get latest data by checking the coupon.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in convenient booklets offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the coupon.

Water Level Controls for Sewage and Water Plants

31. Dependable float-operated pump and motorized valve controls for single or multiple pump installations are described in bulletins issued by the Water Level Controls Div., Healy-Ruff Co., 719 Hampden Ave., St. Paul 4, Minn. All units feature splash proof construction, mercury tube switches.

What You Should Know About Turbine Pumps

167. In a colorful bulletin titled "Water Where You Want It . . . When You Want It" the Johnston Pump Co., Bin "K", Pasadena 8, Calif., gives details on turbine pumps with semi-open or closed impellers; oil or water lubrication; and adaptations for any power source or combination thereof. Get your copy of Bulletin 1015 by checking the coupon.

Explaining the Water Diaphragm Principle of Chlorinator Operation

243. The features, operation and benefits of the water diaphragm principle of chlorinator operation are fully described and illustrated in Publication TA-1026-C-1 recently published by Wallace & Tiernan Inc., Belleville 9, N. J. This helpful publication is yours for merely checking the coupon.

Get the Facts on The Contact Aeration Process

303. Full engineering details on the submerged contact aeration process of sewage treatment, including diagrams of plant units, area requirements, operating costs and other details are available in a bulletin of the Hays Process Co., Box 768, Waco, Texas. Check the coupon to get the facts.

Points to Consider in Filter Sand Selection

322. Best operation of rapid sand filters requires filter media which is hard, properly shaped, carefully graded and perfectly clean. Filter sand and gravel which meets these exacting requirements is available on short notice from Northern Gravel Company, Box 307, Muscatine, Iowa. Get full details by checking the coupon.

What You Should Know About Steel Reservoirs and Standpipes

163. In a handsome 24-page booklet "Horton Steel Reservoirs and Standpipes," the Chicago Bridge & Iron Co., Chicago 4, Ill., shows installations from 50,000-gal. to 10,000,000-gal. capacity with several types of roof and special architectural features. Engineering data includes information on capacities, foundations and improved surface protection. Check the coupon to get your copy.

Does Your Water Works Have Standby Power?

224. Dependable Climax power plants are ready for emergency service to insure fire protection, and can also save power costs by peak load operation. Use the coupon for full data on Climax, 40 to 495 HP, operating on sewage or natural gas, butane or gasoline. Climax Engine & Pump Mfg. Co., So. La Salle St., Chicago 3, Ill.

For Prompt Service Use The Coupon

Valuable Booklet on Porous Diffuser Plates and Tubes

341. A helpful 16-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in rapid sand filters and activated sludge plants. Full data are provided for the consulting engineer. Maintenance of porous media is also discussed at some length. Get Form 140 from Norton Co., Worcester 6, Mass. by checking the coupon.

Diesel Engines For Municipal Power Needs

359. Dependable power for water supply or flood control pumping stations, stationary or portable electric plants and many other municipal needs can be provided by engines described in literature of the Enterprise Engine & Machinery Co., 18th & Florida Sts., San Francisco 10, Calif. Get latest data by checking the coupon.

ASH or CA$H?

from your SEWAGE DISPOSAL PLANT

The new sewage disposal plant in Wyomissing Valley, Pennsylvania (Albright and Friel, Philadelphia, consultants), could have been designed for incineration. But it wasn't. Here's why..

It was known that the sludge would be free from contaminants. By flash drying and selling this sludge, the plant could perform a service to the community and to itself. Dried sludge is rich in humus, is easy to handle and contains the elements found in good topsoil. After being dried, an excellent organic soil conditioner could be made available to the public at a reasonable price. At the same time, the problems of incineration – ash handling and disposal, for example – would be avoided while the revenue from the sale of dried sludge would help offset operating expense.

Naturally Wyomissing Valley chose cash not ash. And, since the plant is located within a few hundred feet of a new apartment development a C-E high temperature deodorization system is incorporated in the design to guarantee odor-free operation.

Actual operation of this plant has confirmed the wisdom of the decision made in Wyomissing.

In communities where the character of the sludge makes it unsuitable for use as a soil conditioner, incineration may be the only answer. But, whether you plan to incinerate or dry, the C-E Raymond Flash Drying System can be designed to allow you to do either at will. Like the communities listed at the right, you too can end your sludge disposal problems effectively and at less cost with the service-proved C-E Raymond System. For full information, contact the C-E Raymond office nearest you. A C-E specialist will be glad to help you.

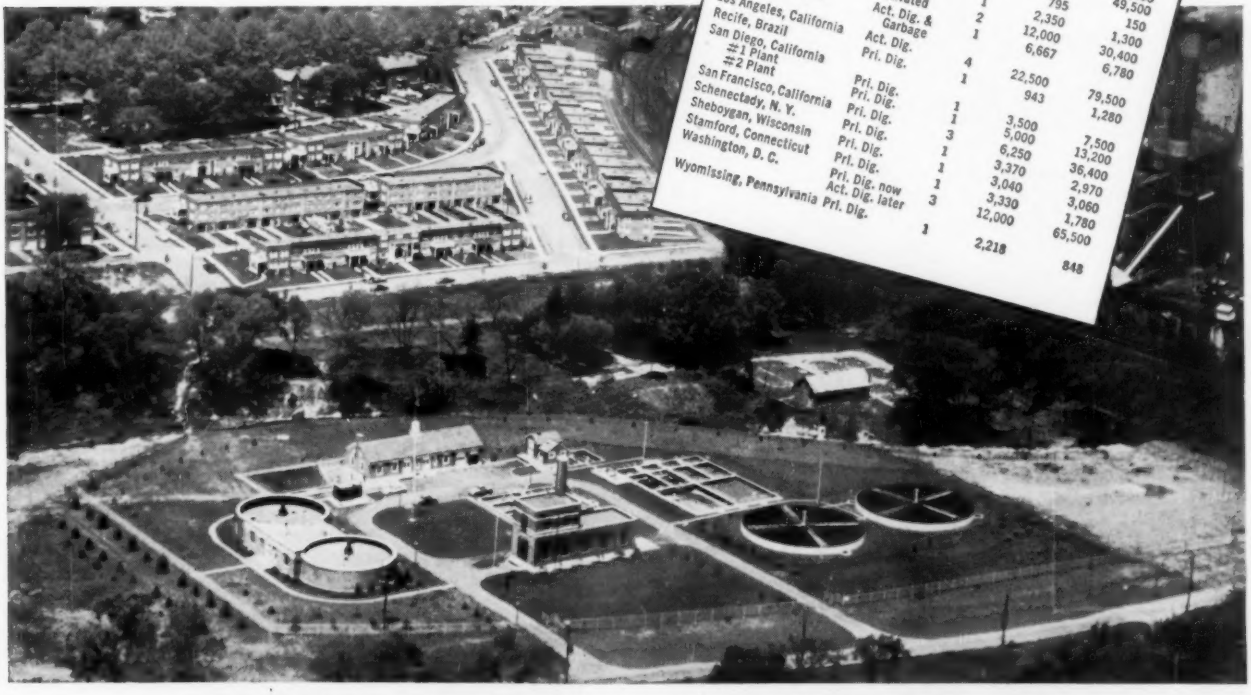
B-810

Wyomissing Valley picked CA$H

C-E

C-E RAYMOND FLASH DRYING SYSTEMS PRODUCING FERTILIZER

CITY	TREATMENT	NO. UNITS	SIZE OF UNITS Lb. Water per Hour per Unit	INSTALLED CAPACITY Tons Fertilizer Per Year
Baltimore, Maryland	Act. Dig.	3	6,140	29,800
Battle Creek, Michigan	Pri. Dig.	1	2,370	2,550
Chicago, Illinois				
Calumet	Activated	3	6,667	15,850
Southwest	Activated	8	21,000	148,500
Southwest Ext.	Activated	6	21,000	49,500
Edgewater, New Jersey	Pri. Dig.	1	795	150
Fond Du Lac, Wisconsin	Pri. Dig.	1	2,350	1,300
Houston, Texas	Activated	2	12,000	30,400
Lansing, Michigan	Act. Dig. & Garbage	1	6,667	6,780
Los Angeles, California	Act. Dig.	4	22,500	79,500
Recife, Brazil	Pri. Dig.	1	943	1,280
San Diego, California	Pri. Dig.	1	3,500	7,500
#1 Plant	Pri. Dig.	1	5,000	13,200
#2 Plant	Pri. Dig.	3	6,250	36,400
San Francisco, California	Pri. Dig.	1	3,370	2,970
Schenectady, N. Y.	Pri. Dig.	1	3,040	3,060
Sheboygan, Wisconsin	Pri. Dig. now Act. Dig. later	3	3,330	1,780
Stamford, Connecticut	Pri. Dig.	1	12,000	65,500
Washington, D. C.			2,218	848
Wyomissing, Pennsylvania	Pri. Dig.			



COMBUSTION ENGINEERING

RAYMOND DIVISION

1315 North Branch Street, Chicago 22, Illinois

Eastern Office: 200 Madison Avenue, New York 16, New York • Western Office: 510 West Sixth Street, Los Angeles 14, California

ALSO FLASH DRYING AND INCINERATION SYSTEMS FOR INDUSTRIAL WASTE DISPOSAL

Get full details of this month's products . . . mail your Readers' Service card today.

To order these helpful booklets check the coupon on page 32.

How Cities Clean Sewer Lines From Street in One Operation

25. In a helpful 28-page handbook of sewer cleaning methods and equipment the makers of OK Champion sewer cleaners give full details of power and hand operated models. Also included are data on expansion buckets that take dirt from sewer to street in one operation, root cutters and other accessories. Get your copy by checking coupon. Champion Corp., 4752 Sheffield Ave., Hammond, Ind.

Manual Covers All Types Of Pipe and Service Repairs

266. Full details on the entire line of Skinner-Seal pipe repair clamps, service fittings and drilling equipment are presented in a new catalog and service manual offered by the M. B. Skinner Co., South Bend, Ind. Step-by-step installation pictures and captions give clear, concise instructions for the repair of all types of pipe leaks. Get helpful Catalog GW by checking the coupon.

Engineering Data on Equipment for Municipal Water Conditioning

347. For information on the design and operation of many types of water treatment plant equipment, including the Graver Reactivator, pressure filters, iron removal installations, zeolite softening and water conditioning for swimming pools get Bulletin WC-113 from Graver Water Conditioning Co., 216 West 14th St., New York 11, N. Y. Check the coupon.

Modern Filtration of Swimming Pool Water

351. Latest data on filtration systems for swimming pools of 50,000 gallon capacity and over is presented in 24-page bulletin No. 625 by R. P. Adams Co., Inc., 225 East Park Drive, Buffalo 17, N. Y. Design and operating data are provided, together with material to assist you in choosing the right filter for your pool. Check the coupon for your copy of this helpful bulletin.

REFUSE COLLECTION AND DISPOSAL

New Roto-Pac Features Speed Refuse Collection

50. Features of the Roto-Pac refuse collection unit, which include automatic continuous loading and packing, with increased power to provide for larger loads in the same size body, are described in bulletins issued by City Tank Corp., 53-09 97th Pl., Corona, L. I., N. Y. Check the coupon now to learn how your collection problems can be eased.

Efficient Material Handling to Reduce Incineration Costs

148. Blaw-Knox Buckets specially designed for refuse and garbage handling are described in 22-page Bulletin 2350-R. Illustrations show progress of material through a modern municipal incinerator plant. Dimensions and incinerator bucket specifications are included. Blaw-Knox Div., 2124 Farmers Bank Bldg., Pittsburgh 22, Pa.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy coupon or write Combustion Engineering Inc., Raymond Div., 200 Madison Ave., New York 16, N. Y.

What You Should Know About Refuse Incinerators

362. Two helpful bulletins tell what you should know about low cost refuse incineration for the small community and for larger cities. Your questions on mechanical stoking, burning rates and operating problems are discussed. Get Bulletins 217 and 223 from Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y. Just check the coupon.

SNOW AND ICE CONTROL

Uniform Salt Spreading Saves Material

219. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on this spreader and table of material application rates. Use coupon or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

New Spin-Zit Salt Spreader

339. A bulletin has just been released on a new salt spreader by the Spin-Zit Salt Spreader Company, P. O. Box 829, New Bedford, Massachusetts. This spreader can be rigged in one minute, weighs 70 lbs., has electric motor powered from truck battery, and has automatic bag opener and screen to name a few of the features. Check the coupon today.

Reversible and Roll-Over Type Snow Plows for any Depth of Snow

389. Village, city, county, state and airport officials send for the latest information on Frink's two catalogues on reversible trip-blade and roll-over snow plows. Complete assembly details, specifications and operation are completely outlined. Write to Frink Sno-Plows, Inc., Clayton, Thousand Islands, New York, or check the handy coupon for the catalogues.

CIVIL DEFENSE

Get the Facts on Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Sign and Signal Corp., 8733 So. State St., Chicago, Ill., by using coupon.

"We save 8% to 15% on Construction costs with Amvit Jointed Clay Pipe"

Says John B. Kelly, President, C. & T. Affiliates, Inc.

"Amvit Jointed Vitrified Clay Pipe cuts costs and speeds construction," says John B. Kelly, President, C. & T. Affiliates, Inc. "We save from 8 to 15 percent on costs when we install Amvit Jointed Clay Pipe."

"The Amvit Joint is built in, ready for installation. Since no special preparations are needed, the line is laid quickly and easily. Immediate backfilling is possible."

City of Camden, N.J.

City Engineer
George Rogers

Assistant City Engineer
John Morgan

When the pipe is "pushed" together, the joint is in constant compression. Water cannot force its way in or out, thus preventing costly ground water infiltration or root penetration.

Amvit Jointed Clay Pipe is just one of the many products manufactured in our plants across the nation. American Vitrified Products Company also produces concrete pipe, clay pipe, flue liners— both glazed and unglazed, and clay liner plates.

For more information, write or call American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you.

The Amvit joint is made of a new acid resistant plastic material with rubber characteristics. Like the pipe, the joints will not be harmed by any condition of underground service. The pipe is simply pushed together. The trench is then ready for backfilling.

SINCE 1900

American Vitrified Products Company

CLEVELAND, OHIO

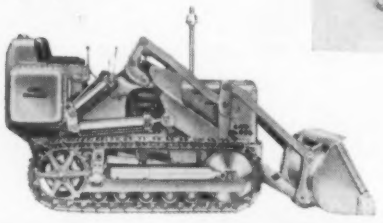
Patent Pending

Plants Across the Nation... Brazil, Indiana • Chicago, Illinois • Cleveland, Ohio • Crawfordsville, Indiana • Detroit, Michigan • East Liverpool, Ohio Fenton, Michigan • Grand Ledge, Michigan • Lisbon, Ohio • Los Angeles, California • Milwaukee, Wisconsin • South Bend, Indiana • Uhrichsville, Ohio

NEW in Traxcavators!

No. 955, 1½-yard capacity. 40-degree bucket tip-back at ground level, new oil-type clutch, convenient lift and dump levers. Modern hydraulic system, high reach. Optional starting.

No. 933, 1-yard capacity. Major features same as the No. 955. *Balanced* to outproduce ordinary tractor-shovels of equivalent capacity.



NEW in Motor Graders!

The new No. 12 with oil clutch. The world's top motor grader is now more economical and efficient than ever. Job-proven oil clutch increases work life with constant oil bath reducing wear on moving parts. Less maintenance. No external lubrication, and no adjustment needed up to as much as 1500 hours. No clutch fade or slippage due to overheating.

HIGHLIGHTS OF THE

NEW in Track-type Tractors!

The new D9. Completely new turbocharged engine. Choice of torque converter or oil clutch drive. "Live-shaft" drive for rear-mounted equipment. Many other important features.

The new D8. With torque converter (Series D); with exclusive oil clutch drive (Series E). "Live-shaft" drive and many other improvements. Shown with new No. 463 LOWBOWL Scraper.

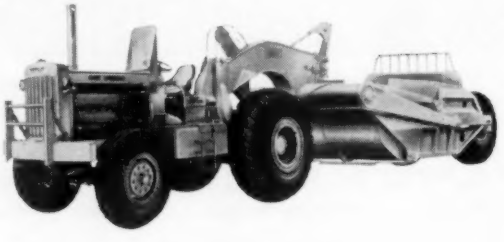
The new D7 (Series C). Drawbar pull 28,700 lb. maximum. Exclusive oil clutch. New starting engine for easier operation. Track shoes hardened by "water quench" process. Other important advances.

NEW in Wheel Tractors!

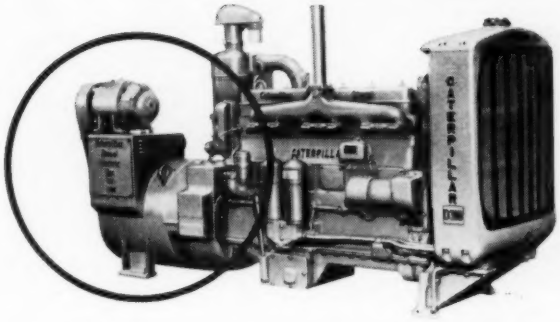
The new DW21 Tractor (Series C). New 300 HP engine with Turbocharger delivers 10% more rimpull. New No. 470 LOWBOWL Scraper, 18 cu. yd. struck, 25 cu. yd. heaped capacity. Big tires for better flotation and maximum traction. Many other new, tested features.

The new DW15 Tractor. 186 HP Cat Engine. 10 forward, 2 reverse speeds. Up to 24 MPH pulling loaded wagon or scraper. Air booster clutch. Air brakes.

The new DW20 Tractor (Series E). 300 HP turbocharged engine. Speeds to 32.1 MPH. Shown with new No. 456 LOWBOWL Scraper. Greater capacity, faster loading, due to new design.



NEW in CAT* Generators!

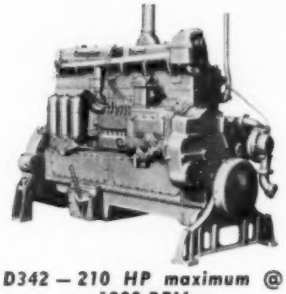


The new Cat Generator. A major development in modern electric power. Gives Caterpillar's new line of Diesel Electric Sets efficiency of externally-regulated set in a self-regulated set — at low price. Close regulation of voltage, no load to full load. Easy hook-up with other generators. Easy starting. No operating adjustments.

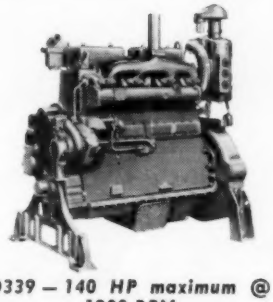
Never before in history has the equipment industry faced such a tremendous challenge as today. Caterpillar is keeping pace with an array of new products that will increase production, cut maintenance costs, work longer and more profitably than any other equipment on the market. These products are the result of continuing research in the laboratory and in the field. They are forceful evidence of Caterpillar Leadership in Action.

NEW EQUIPMENT ERA

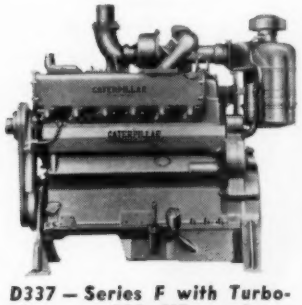
NEW in Diesel Engines!



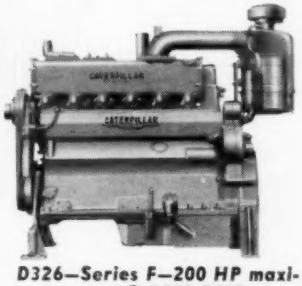
D342 — 210 HP maximum @ 1200 RPM



D339 — 140 HP maximum @ 1200 RPM



D337 — Series F with Turbocharger — 310 HP maximum @ 2000 RPM



D326—Series F—200 HP maximum @ 2000 RPM

These four new Caterpillar Diesels incorporate the latest advances in modern, compact, heavy-duty engine design. Better operation, less maintenance, higher horsepower. Choice of 3 starting systems — air, electric, gasoline. Simple Caterpillar fuel system burns low-cost fuels without fouling. More for your money than any other engines in their power range.

Other new products added to the broad Caterpillar line include Pipelayers, Torque Converters, Welders, Portable Electric Sets.

Year after year you have seen the results of Caterpillar leadership. It is always in action —never stands still. Caterpillar research constantly improves products and develops new ones to help you do more work, in less time, at greater savings to the taxpayer.

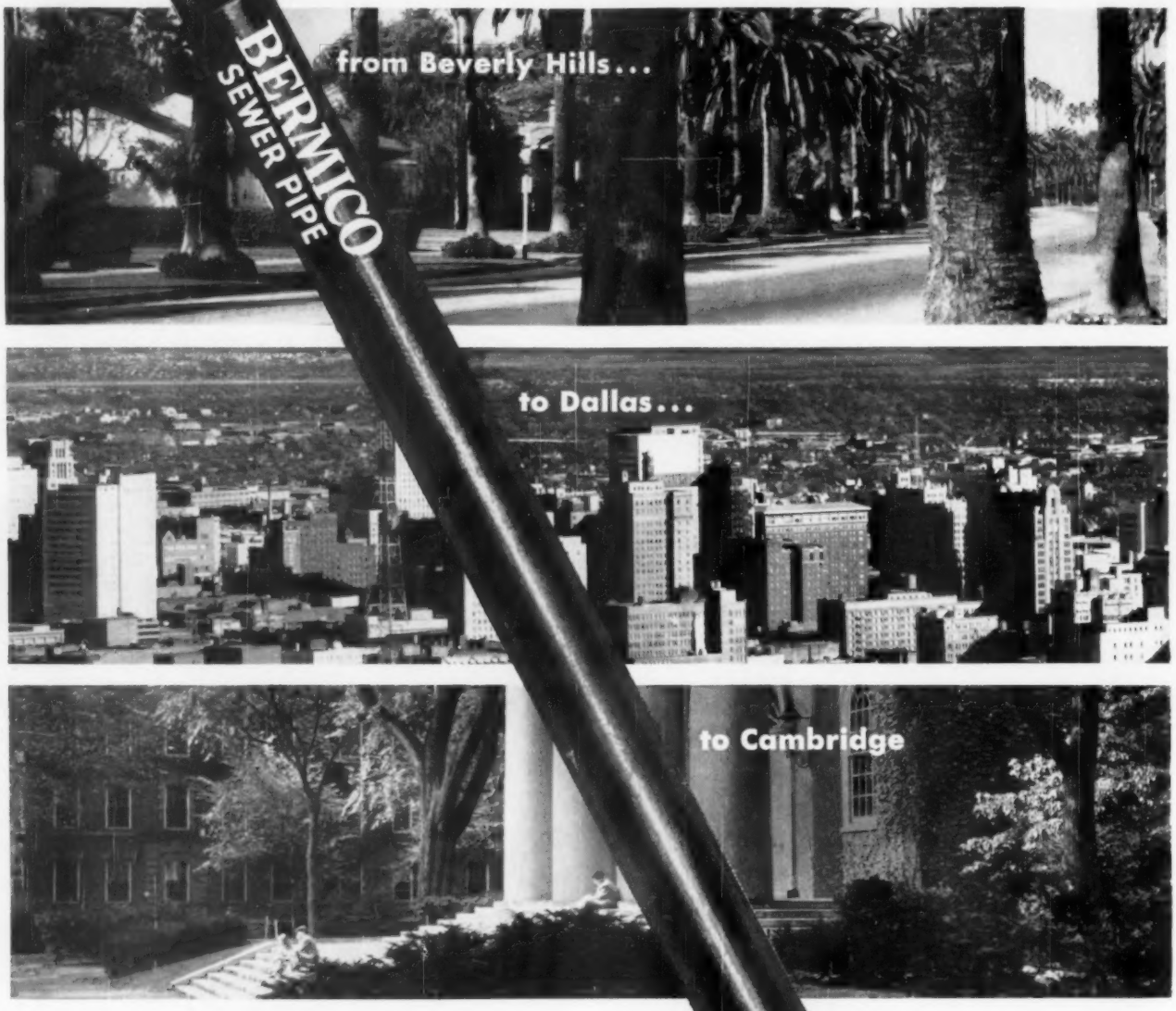
Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

CATERPILLAR*

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

LEADERSHIP IN ACTION

ASK THE CITIES THAT USE IT!



LEARN WHY BERMICO® SEWER PIPE IS GOING INTO MORE PLUMBING CODES THAN EVER BEFORE!

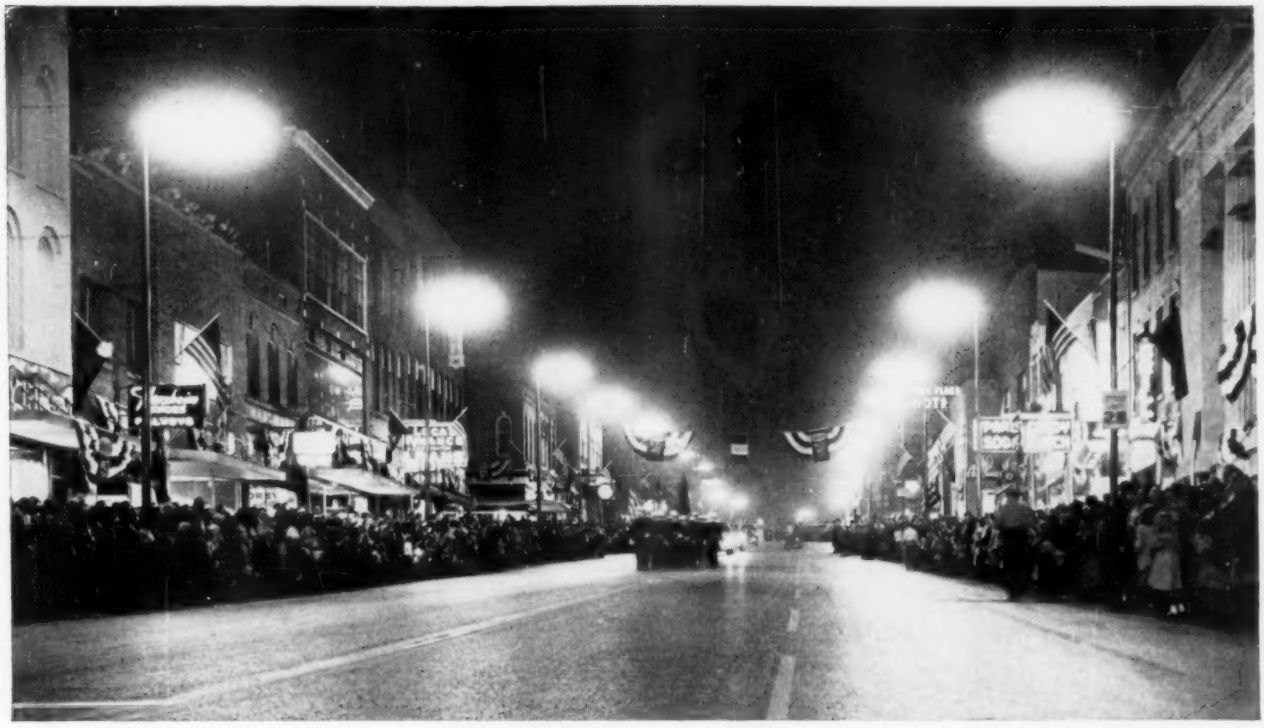
From Maine to California, Canada to the Gulf, sanitary engineers are now authorizing BERMICO bituminized fibre pipe. BERMICO is approved under Federal Specification SS-P-356 and meets all requirements of U. S. Dept. of Commerce CS116-54.

BERMICO's tough wood fibre impregnated with pitch makes it strong, root-proof, corrosion-proof. Its lightweight, 8-foot lengths make for faster, easier installation.

You can't buy and install root-proof sewer pipe for less! Millions of feet of BERMICO are rewarding property owners across the nation with trouble-free service!

Your community can take advantage of this "Modern Pipe for Modern Living." Include BERMICO in your plumbing code. For details write Dept. BE-12, **BROWN COMPANY,** 150 Causeway St., Boston 14, Mass.

Now's the time to mail this month's Readers' Service Card.



Ever Have a "Lights On" Celebration in Your City?

A "Lights On" celebration is a real community occasion. Often an entire town, thousands strong, turns out to see a public official switch on new street lights for the first time.

Why?

One big reason, of course, is the carnival atmosphere. Usually there's a parade, gaily decorated floats, a band or drum and bugle corps, and fireworks. Often the winner of a "parade queen" beauty contest reigns over the fun. Maybe there's a street dance or community "feed" right on Main Street itself.

But there's always a more important reason underlying all this public interest: people *want*, and appreciate, good street lighting. They know they prefer to shop along well-lighted streets. They know they're safer when walking or driving along well-lighted streets. They come to a turn-on ceremony which they know will make their city's lighting compare favorably with neighboring communities.

In short, good street lighting comes to be a bright, visible symbol of the services the people expect—and get—from progressive municipal officials.

Why not talk over your city's street lighting with your local electric utility? You'll find them glad to help you in arriving at planned, practical solutions to your street lighting problems!

"OUT OF DARKNESS," *a new, dramatic film story of how one community met its street lighting problems, is now available to civic groups, community service organizations, etc. This 16-mm, sound, black and white movie runs 26 minutes. Borrow a print of "Out of Darkness" from your nearest G-E Apparatus Sales Office.*

Section F 455-1
Outdoor Lighting Department, General Electric Company
1400 Western Avenue, West Lynn 3, Massachusetts

Please send me a free copy of the 24-page bulletin, "Light The Way to A Better Community."

Name.....

Street.....

City..... **State**.....

Progress Is Our Most Important Product

GENERAL ELECTRIC

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

A G-E PROGRESS REPORT

ON THE RISING

TREND TO FLUORESCENT

More Progressive Cities Adopt Newest Street Lighting Source

Five years ago General Electric introduced fluorescent street lighting to the United States. Today, thousands of these new luminaires are in service all over the nation. Fluorescent's growth rate is higher than that of any other outdoor lighting source.

What are the reasons for this unusually rapid growth?

IMPROVED VISIBILITY

Doubtless the leading cause of fluorescent's rise to popularity is the great improvement in visibility which it brings about. Some lighting experts say that you see about one third better on a fluorescent-lighted street than on one illuminated to the same level by mercury or filament luminaires. This improvement

NATION'S LARGEST fluorescent street lighting installation is inspected by Minneapolis officials. Flanked by G-E sales manager John Pike and lighting specialist Ernest Wendling, Minneapolis aldermen Frank V. Moulton, George E. Johnson, Jr., and George W. Martens watch installation of Form 206 luminaire.

3.3 MILES of Lake Street now have maintained illumination level of 1.5 foot-candles from G-E fluorescents. 500 of these units have been placed in service in this important business area. Installation is part of city-wide lighting expansion program.

"RECEIVED ONLY FAVORABLE comments on the new lights" says J. W. Monk, Dallas public utilities supervisor. Travis Winter, Dallas P&L, worked with Mr. Monk in obtaining decision to install more than 300 fluorescents in downtown Dallas.

EXCEPTIONAL "SEE-ABILITY" characterizes Lexington Street, Baltimore, under its new General Electric fluorescent street lighting. City and Baltimore Gas and Electric Company are also progressively relighting other areas.

is due to (a) reduced luminaire brightness, (b) improved pavement brightness uniformity and (c) excellent color quality from the "cool white" fluorescent lamp.

PLEASANT, "COOL-WHITE" LIGHT

There's no distortion of colors from the "cool white" light of fluorescent lamps. People's complexions and clothes, familiar objects, etc., look the same under this comfortable light as under sunlight.

MODERN APPEARANCE

The distinctive lines, up-to-date design, and functional beauty of the General Electric Form 206 luminaire make it an asset to any street's appearance.

LOWER MAINTENANCE

The average effective life of a fluorescent street lighting lamp is about two years! The hinged plastic globe enclosing the lamps is shatterproof. Neither the globe nor the light output is unduly affected by sun, rain, heat, cold, dirt, or aging.

LOWER COST

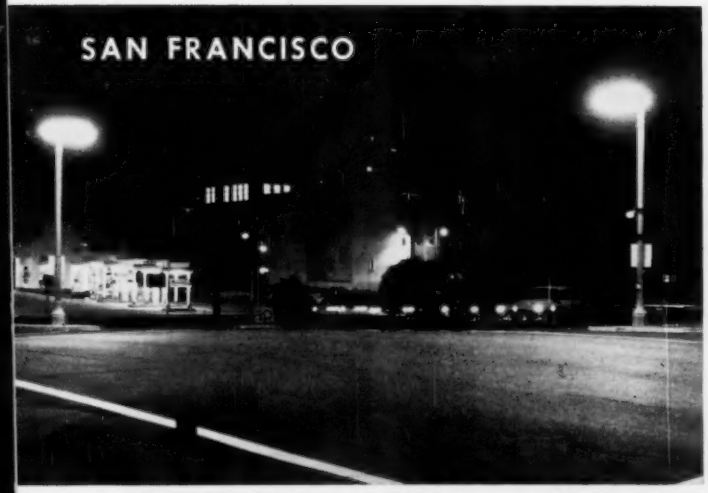
Compared on the basis of judged equivalent visibility with either color-improved mercury or filament, the G-E Form 206 fluorescent luminaire costs less than these other systems! While fluorescent equipment and amortization costs usually are somewhat higher, installation costs are about the same and operating and maintenance costs are generally lower.

MORE INFORMATION?

You can get complete information on the Form 206 fluorescent luminaire from your nearest G-E Apparatus Sales Office, agent, or distributor. Or, write Section 452-161, Outdoor Lighting Dept., General Electric Co., 1400 Western Ave., West Lynn 3, Mass.

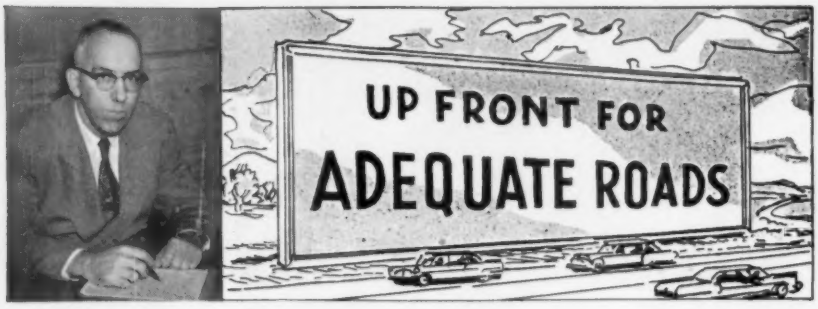
Progress Is Our Most Important Product

GENERAL ELECTRIC



"ABSOLUTELY THE BEST" said S. Ivan Sandberg, of San Francisco's Department of Public Works, about the General Electric Form 206 luminaire. Intersection above is near famed Golden Gate Park.

"PAVEMENT GLARE IS REDUCED on Lexington Avenue during rainy or foggy weather" according to Armand D'Angelo, N. Y.'s Deputy Commissioner of Water Supply, Gas and Electricity.



by LEO J. RITTER, JR.

Stage Construction — The basic principles of stage construction, by which a highway or street is gradually improved in a planned series of steps, are of fundamental importance to many local governmental units. Two outstanding examples of stage construction have recently attracted our attention. One of these is the construction plan being followed in North Carolina, which was described in a recent issue of the *Asphalt Quarterly*, and is illustrated herewith. This plan involves three separate and distinct phases before construction is complete. The first stage, which is usually completed in one construction season, consists of clearing and grubbing, grading, and the construction of necessary drainage structures. The following season a flexible-type base course with an asphalt surface treatment is built (second stage). Traffic is then allowed on the road for a period of approximately two years, after which time a high-type wearing surface of hot, plant-mixed asphaltic concrete is placed as a third and final stage. The other example is the recent reconstruction of a portion of U. S. 40 in Maryland. In this plan, a 10-inch waterbound macadam base course was built on a 4-inch gravel subbase, primed with MC-1 asphalt and topped with a seal coat; this construction took place in the fall of 1954. Traffic used the road during the winter and spring. Last summer, the second stage was carried out by construction of a leveling course, followed by the application of a 2-inch plant mix binding course and a 1½-inch dense-graded, asphaltic concrete surface course.

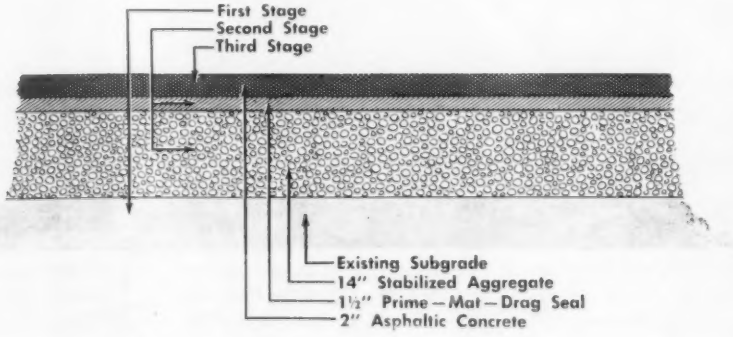
New Publications — Many things seem to go in cycles; and new, worthwhile publications seem to be no exception. A recent rash of them has come to our attention, including the following:

(1) A technical glossary of geologic terms, published by the Colorado Scientific Society, Box 688, Denver 1, Colorado ($3.50 cloth bound, $2.75 paper bound). The glossary contains almost 2700 entries, with emphasis on the broad field of general geology; it is primarily intended for civil engineers and specialists in various related fields.

(2) A new edition of the Concrete Manual prepared by the Engineering Laboratories of the Bureau of Reclamation. It contains information which has become available since publication of the last edition in 1949. It is priced at $2.50 and is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.

(3) We're not sure how new they are, but we hadn't before seen a series of five small booklets dealing with salt-soil stabilization, prepared by the Industrial Division of the International Salt Company, Scranton, Pennsylvania.

(4) The 1955 edition of Auto-



FITCHBURG CHIPPERS cut Brush Disposal Costs 25-50%

Read how Bridgeton, N. J. solved the problem left by Hurricane Hazel — 1000 trees down!

The Park and Shade Tree Commissions
BRIDGETON NEW JERSEY

MEMBERS
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ALLISON CAMERON, Clerk
HOWARD L. GANDY, Superintendent

June 10, 1955

Fitchburg Engineering Corporation
Fitchburg, Massachusetts

Gentlemen:

The City of Bridgeton has an 1100-acre park, complete with zoo, a raceway, two lakes and a large rhododendron grove.

Hurricane Hazel left our park practically devastated, with a thousand trees down. Our white pine grove was ruined and our picnic areas were a shambles.

Our City Council authorized the purchase of a Model C-612 Fitchburg Chipper, because we were getting nowhere removing the brush from the park.

Since we've had the Chipper we find we can easily chip 8 or 9 truckloads of brush into one dump truck. We've stockpiled the chips and we find that they're in great demand by gardeners and nurserymen, so there's no trouble getting rid of them.

Another thing — because of the feed plate with its safety spring the men can't get hurt by any backthrow from the Chipper.

We save the labor of two men with our Fitchburg Chipper and we have saved several months' time in cleaning up after Hazel. Our Chipper is in frequent use either by us or by the Department of Streets and Roads to remove brush and fallen trees both in the park and along the streets.

Yours truly,

Howard L. Gandy

HOWARD L. GANDY
Superintendent

HLG/sv

FITCHBURG ENGINEERING CORPORATION
FITCHBURG, MASSACHUSETTS

When you want to cut brush disposal costs, investigate a Fitchburg Chipper. There is a model to fit your specific needs.

City after city is saving many manhours and heavy trucking expense—cutting disposal costs 25-50% with these rugged, well-engineered machines. Only Fitchburg Chippers have the patented Safety Spring action which provides equal ease in chipping all sizes of wood to the machine's rated capacity.

Mahwah, N. J. saves 3 men

"Our Fitchburg Chipper was purchased in May 1954. It will take only a short time to pay for itself. We hired 6 men to cut and clean up brush. Now with the Fitchburg Chipper we only need 3 to do the same work. All brush is cut and chipped the same day. This eliminated unsightly heaps along the roadside. In wooded areas the chips are blown back along the roadsides and serve as mulch for forage."

Hartford, Conn. saves manpower-trucking costs

BRUSH DISPOSAL: "Our Highway Division has used our Fitchburg Chipper to clean up the brush and branches along newly developed road areas. By chipping brush, the city saves in use of both manpower and trucking costs." ROAD CLEARANCE: "If we get hit again by hurricanes or bad wind storms, we now have an excellent piece of equipment that will enable us to readily open up the streets for emergency traffic by reducing the fallen branches to chips."

A word about Sealed Bids—

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Now's the time to mail this month's Readers' Service Card.

mobile Facts and Figures is now available from the Automobile Manufacturers Association, New Center Building, Detroit 2, Michigan.

Federal Airport Program —A guidebook for the new federal-aid airport program is now available. The booklet, which is written primarily for potential airport sponsors, is called "Federal Aid Airport Program Policies and Procedures". It contains detailed sections on Policy for Administering the Federal Aid Program, Planning Standards for Public Airports, and Programming standards for the F A Airport Program. In addition, it contains a step-by-step guide outlining the principal actions in the processing of a project from the filing of a request to the completion of a project, instructions and a filled-in example of the form upon which the request should be filed, and related information. It is available from the Department of Commerce, Washington 25, D. C. at a cost of 50 cents.

Ice Control—An interesting report of the Committee on Effect of Ice Control appears in the October issue of Highway Research Abstracts. This is an interim report giving the results of a questionnaire survey of the various state highway departments regarding the use of chlorides (calcium and sodium) for ice control and the effects of their use. Among the findings of the Committee are the following:

(1) All of the states considered in the survey used either sodium or calcium chloride. Fifty-eight percent used both of these chlorides in winter maintenance. Only two states used rust inhibitors and these to a very limited extent.

(2) Nearly 88 percent of the states indicated some form of damage to concrete pavements because of the use of chlorides.

(3) It was considered best by most states that new concrete should have time to age before chlorides were applied to it. The desirable age of concrete before chloride application was estimated at 3 years.

(4) The states used chlorides in varying amounts over the roads. Sodium chloride in the clear averaged about 400 pounds per mile; with abrasives, about 300 pounds per cubic yard. Calcium chloride in the clear averaged about 200 pounds per mile; with abrasives, about 300 pounds per cubic yard. Calcium chloride was more generally favored

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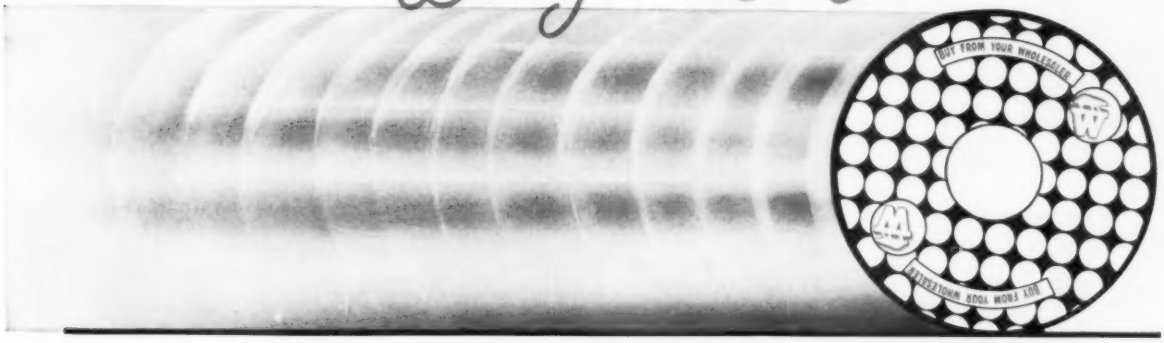

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In the first place Wolverine's round carton reduces tube handling time. It can be rolled—like a hoop—from truck to job-site or wherever needed. Carrying is easy—all you do is slip it over your arm or shoulder.

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with abrasives, while sodium chloride was more generally favored in the clear.

(5) Even though many states indicated varying damage to roads from chloride application, 67 percent of them said that direct application of the chemicals was justified when considering time saved to the traveling public, reduction in driving hazards, etc.

(6) Of several states having had experience with air-entrained concrete for any length of time, they seem generally to agree that air-entrained concrete is more resistant to chlorides than is plain concrete.

People—Carl W. Brown, former Chief Engineer of the Missouri State Highway Department, passed away in September. A. L. Wiesenberger has been named chief engineer of the Pennsylvania Department of Highways. Eugene F. Gibbons is the new chief engineer of the New York State Department of Public Works J. Clark Akers, veteran county engineer of Davidson County, Tennessee, has retired. D. Grant Mickle of the Automotive Safety Foundation received the 1955 David Beechcraft Award on Traffic Safety at the recent National Safety Congress in Chicago.

This'n That—Fifteen college and university faculty members from seven Pennsylvania schools took part in the 500-mile, four-day tour of outstanding construction projects in the state last summer; the tour was sponsored by the Associated Pennsylvania Constructors. Three big meetings in January: Highway Research Board, Washington, Jan. 16-20; American Road Builders Association, Miami, Jan 11-14; Associated Equipment Distributors, Chicago, Jan 29-Feb. 2. Construction of the $65 million cantilever bridge across the Mississippi at New Orleans is proceeding on schedule; when completed in 1958, it will have the longest cantilever span in the U. S. (1575 feet). A new airlines terminal building has been opened on the west side of Manhattan to serve Newark Airport. The Arizona State Highway Department has inaugurated a training program for young engineers. The national rate of traffic fatalities dropped to a new low of 5.8 per 100 million vehicle miles of travel during the first seven months of this year. The Texas Highway Department is now using the **compaction ratio**, which expresses the degree to which it is desirable to compact soil materials on the basis of the compactibility of the material, to control the density of subgrades, subbases, and bases.

NEWS OF ENGINEERS

CLARK, GROFF & CAVE is the new name for the former engineering firm of Clark & Groff, 3240 Triangle Drive, Salem, Oregon. Mr. Cave brings to the firm long experience and skill in the architectural field, supplementing the sanitary engineering and construction know-how of Messrs. Clark and Groff.

FRED S. CHILDS of Bogert & Childs, consulting engineers of New York City and Hackensack, N. J., has been elected president of the New Jersey State Board of Professional Engineers, for his third term; he has been a member of the Board for 16 years.

FRANK C. AMSBARY, Jr., who is president of the AWWA, has been made vice president and general manager of the Long Island Water Corp., which serves 19 south shore communities.

H. G. BAITY HAS retired as professor and head of the Department of Sanitary Engineering in the School of Public Health, University of North Carolina, Chapel Hill, N.C., and has been succeeded by DANIEL A. OKUN. Gilbert L. Kelso has been appointed an Associate Professor.

Dr. Baity is at present serving as the Director of Environmental Sanitation of the WHO in Geneva, Switzerland. Dr. Okun came to the University from Malcolm Pirnie Engineers in 1952, on leave of absence to fill Dr. Baity's place. Other members of the faculty at UNC, Chapel Hill, include Prof. Emil Chanlett, Prof. Marvin Granstrom and Dr. Gerald Lawton.

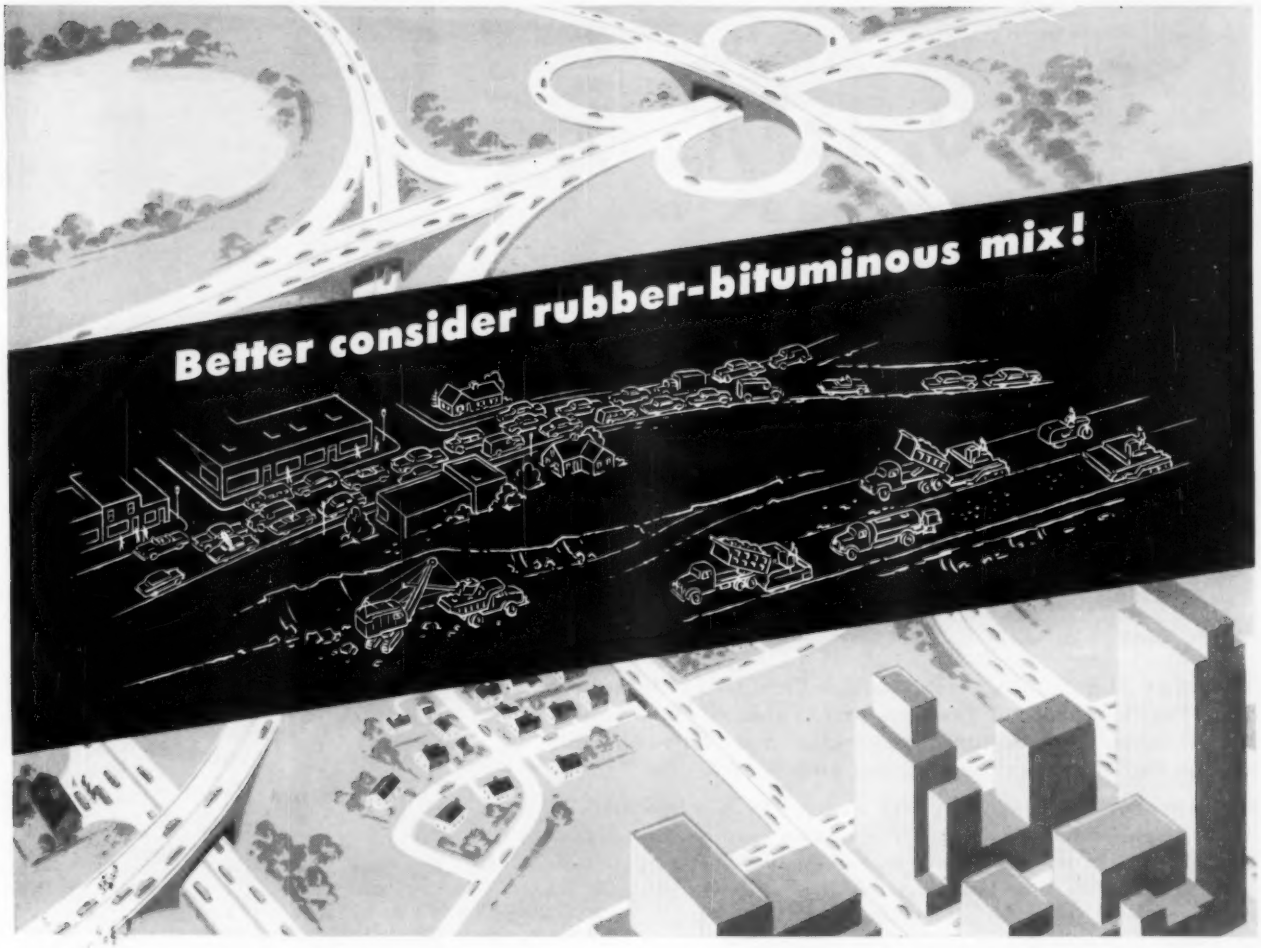
FRANK WOODBURY JONES of Havens & Emerson, Consulting Engineers, Cleveland, O., died on November 17.

• • •

Weed Control Meeting

On Thursday, January 5, 1956 an all day session on Public Health in connection with the Weed Association of America will be held at the Hotel New Yorker in New York City. The program will provide information regarding the botanical, ecological, meterological, public health and control aspects of weeds that are detrimental to health.

PLANNING YOUR ROADS FOR "FUTURE" TRAFFIC?



In the next ten years you should see some 20 million more cars on the road. This means bigger problems in maintenance, particularly if main streams of traffic have to be re-routed through your community. And one of the most efficient and economical methods of minimizing maintenance problems and increasing the load-carrying capacity of roads is to use Surfa-Sealz Pellets.

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• INDUSTRIAL EXPANSION
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More than 32 miles of Clay Pipe in sizes from 6 to 24 inches are being installed in Waco, Texas, as part of that city's $5 million bond-financed sewer improvement program. Clay Pipe is helping to solve two of the city's most urgent problems:

PUBLIC HEALTH When the city was alarmed by a polio outbreak in the neighborhood of an orphanage, investigation showed that breaks in an old non-clay sewer pipe allowed sewage to flow into a creek bordering the institution. Medical authorities suspected a connection between the polio epidemic and the sewage overflow. Clay Pipe was installed as a public health measure.

INDUSTRIAL EXPANSION. In two huge new industrial areas opened by the Waco Industrial Development Association, Clay Pipe was used exclusively to handle the chemicals, dyes, acids, and other corrosives commonly found in industrial sewage.

In other sections of the city, acid soils made Vitrified Clay Pipe a "must." There's no safe substitute for Clay Pipe. *It's guaranteed for 50 years.*

City officials directing the project include Mayor H. F. Connally, Jr., City Manager Jack Jeffrey, and City Engineer Eugene Shields. Private Contractors: J. D. George & Co., Rogers Smith Construction Co., and Parks and Andrews.

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Now's the time to mail this month's Readers' Service Card.

PUBLIC WORKS MAGAZINE
DECEMBER

Sanitary Refuse Fills IN "WET" AREAS

C. A. ROGUS
Director of Engineering
Dept. of Sanitation, New York City

THE SCIENCE of disposing of municipal refuse by sanitary landfilling has been progressively developed to a point where it is generally acceptable to health authorities and public alike. Its low operating and capital cost, simplicity and flexibility of operation, ability to accommodate all types of materials without need for separate collection, and the attendant reclamation of oft times otherwise non-usable lands have been the major advantages. The principles of successful filling in "dry" areas have been documented repeatedly in engineering literature. Those for filling in "wet" areas, however, are covered meagerly, if at all. The object of this article, therefore, is to review briefly the major criteria applicable to all types of fills and to emphasize phases peculiar to wet conditions.

"Wet" areas may be grouped into: 1. Swampy or marshy areas; 2. Tidal areas with fluctuating water depths; and 3. Ponds, quarries or similar depressions with maximum depths of about 25 ft.

There are certain features which are common to all types of refuse fills, "dry" or "wet".

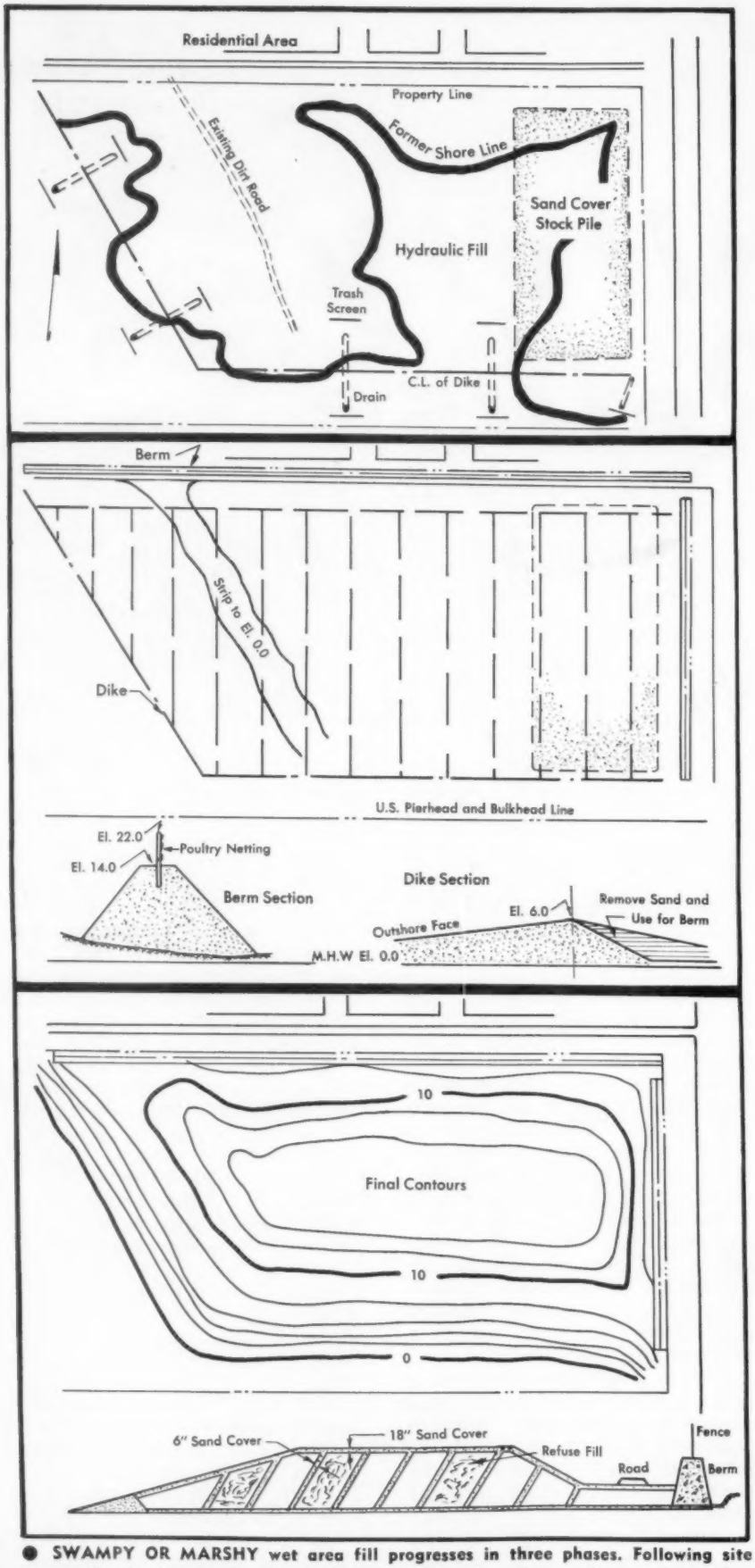
1. Refuse: All types of materials can be disposed of and segregation or separate collections are unnecessary. Quantity and composition varies with climate, geographic location, seasons and years. Per capita, the daily amount of all refuse requiring municipal disposal ranges from 2.0 to 3.75 pounds. Typical, present day composition of refuse from urban areas in the northern belt averages about 20% garbage (food wastes), 45% rubbish (organic and inorganic), and 35% ashes. Overall moisture content, as collected, averages 20%, while density ranges from 275 to 500 pounds per cu. yd., depending largely on the ash content and degree of compaction in the refuse collection truck. Some "fluffing-up" occurs in the dumping operation.

2. Settlement: Initial shrinkage in dumped refuse is produced by compaction from the heavy operating equipment and the weight of the refuse and cover overburden. Subsequent shrinkage develops from filling in of voids left by the rusting out of the semi-empty tin cans and the decomposition of the organics. Further subsidence may develop through the compression or shifting of underlying subsoils and through the expulsion of entrapped waters, particularly in waterlogged silty soils.

Initial settlement shrinks each 2 cu. yds. of truck material to 1 cu. yd. in the fill. Subsequent compaction and settlement increases this shrinkage so that finally each 2 cu. yds. of refuse in the truck reduces to 1 cu. yd. in the fill.

As a rule, about 90% of the total settlement occurs in the first two to five years. The remaining 10% may be of such a long range character as to have little bearing on the planned grades for the site. Usual practice calls for initial compacted grades to be about 1/3 higher than those ultimately required. Subsequent annual settlements, decreasing progressively from about 15% the first year, 6% the second year and about 3% each in the next two to four years, will ultimately absorb this 33% overfill. Fills on marshy lands, in boggy areas, and in ponded or open waters will have substantially greater settlements and higher rates because of accelerated decomposition, possible leaching action, subsurface subsidence, and mud wave displacements.

These average shrinkages and settlements require local checking to fit existing conditions. In any event, because of the many variables present, occasional regradings



● **SWAMPY OR MARSHY wet area fill progresses in three phases. Following site preparation (top), operational steps include construction of berm, barrier fence, dike and fill placement in 150-ft. wide strips. Bottom view shows final contours.**

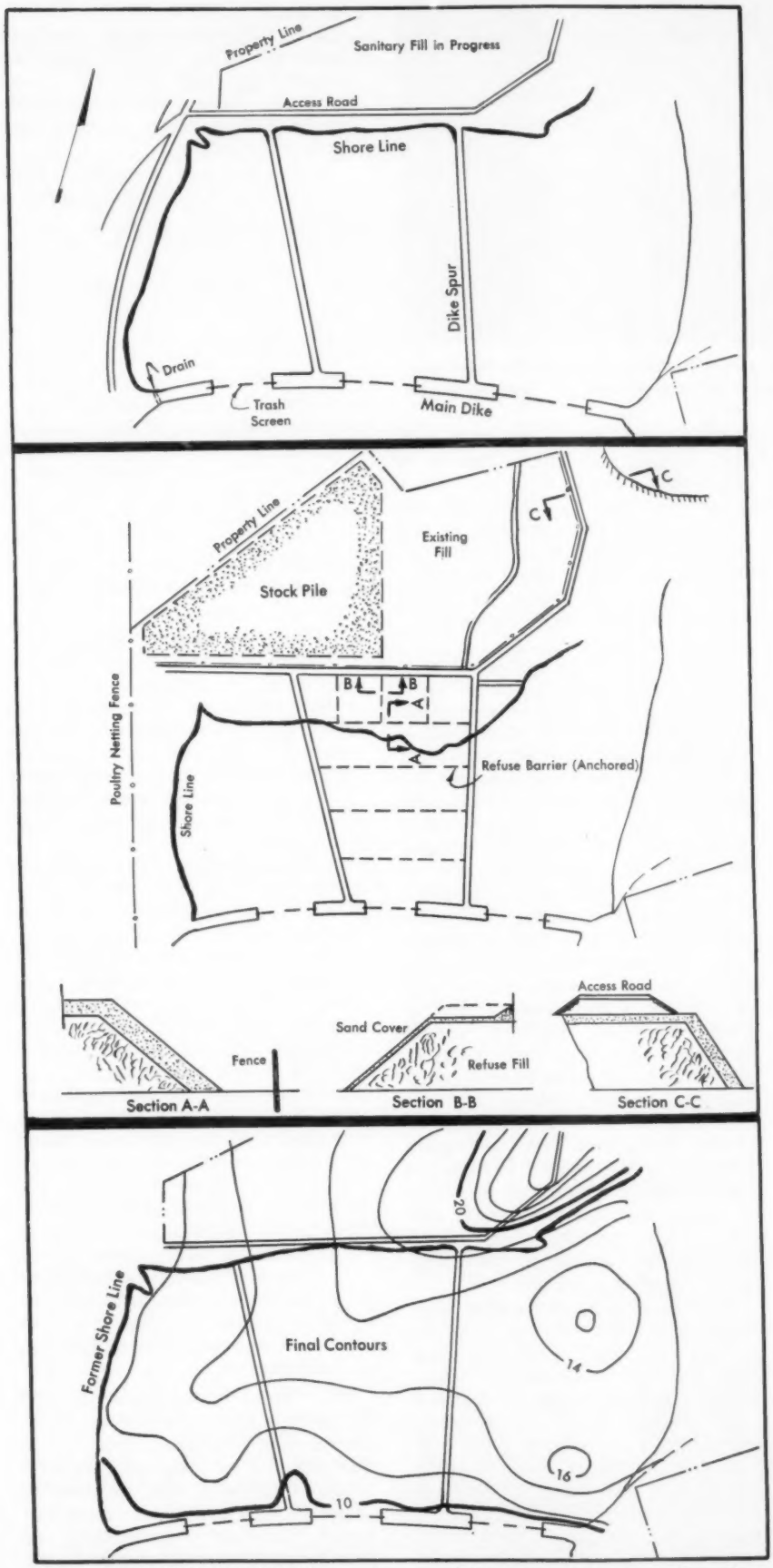
and maintenance of the completed surfaces will be required until the fill area has become reasonably stabilized.

3. *Bearing Values*: Static and dynamic field tests on refuse fill with an average life of four years and an average compacted depth of twenty feet, placed on top of a 10-ft. to 15-ft. layer of weak, compressible organic silt and meadow mat developed the following findings: *Dynamic Loadings*: a. Freshly placed, compacted refuse will support repeated loadings of large rubber tired equipment in excess of 25,000 pounds per tire. This supporting value is somewhat lower for older refuse fills, particularly when uncovered and wet. b. Rubber tires provide better load distribution than steel crawler treads; they produce less edge sheer and decrease degradation of the refuse. *Static Loadings*: Well seasoned refuse fills placed in "wet" areas will support uniform loads of the order of 2,500 pounds per square foot if subjected to an equivalent preload for at least one year. Heavier loadings may require special foundation designs and certainly each fill should be studied individually.

4. *Decomposition*: Tin cans and other metals rust out at varying rates. Those at or near the surface (top 3 ft. layer where some moisture and oxygen are normally present) will mostly break-up within about one year; the balance at varying rates up to about five years. Breakdown of the putrifiable organics is aerobic in the top 2 to 4-ft. layer, and anaerobic at greater depths. The aerobic decomposition is quite rapid and inoffensive. The anaerobic decomposition is slower and may release odorous gases through settlement cracks to produce offensive nuisances.

5. *Odor Control*: Odorous gases are the product of surface putrefaction or of deep-seated anaerobic digestion. Surface pools with churned-in, high organic content, polluted stagnant drainage ditches, and leachings from refuse piles are other potential areas of anaerobic digestion.

The best controls are: 1, rapid and continuous coverage of freshly placed refuse, particularly garbage; 2, sealing of surface cracks in completed areas to control or stop emission of gases; 3, elimination of surface pools, side leaching action and seepages at toes of filled embankments; and 4, spraying with suitable deodorants. Promptness is essential to forestall public com-



● **IN TIDAL WET AREAS dikes and spurs divide site into lagoons. Operational steps are similar to those of swampy areas with the addition of anchored refuse barriers to keep water in the lagoon clean. All leveled fill is covered promptly.**

plaints. For deodorizing, an emulsion of Orthodichlorbenzine, mixed one part chemical to 125 parts water has been found quite satisfactory. It can be sprayed at a rate of about 6,000 gallons per acre of offending area with a conventional fire hose and nozzle. This chemical is largely a masking agent with some larvicidal properties. The moisture added by this spraying promotes more rapid digestion and stabilization of the putrifiables.

6. Fire Control: Accidental fires within the freshly placed material or even within the completed fill are not infrequent. The causes are dumping of hot ashes or incinerator residue, spontaneous combustion or presence of highly flammable materials. Fires are a safety hazard and create smoke and odor nuisances. When near the surface, they are readily extinguished by surface spraying either from specially designed large mobile tanks or street flushers, or from street hydrants, if available. Deep seated fires can be brought under control best by rooting them up with bulldozers for surface exposure and surface spraying. Both surface and deep seated fires may at times be extinguished economically and successfully by smothering with an impervious surface blanket of earth.

Preplanning

To be successful and economical a sanitary fill should be handled like any other engineering endeavor. Advance planning, involving preliminary studies, drawings and specifications followed by competent, conscientious execution safeguards against waste, breakdowns, pollution and public complaint. This preplanning may be separated into three distinct categories. The first concerns itself with the selection and preparation of site; the second with estimating equipment and personnel requirements, and setting up proper operational steps, their sequence, timing, and detailed performance; the third with the proposed land usage and development.

Site Preparation—In selecting the dumping site, consideration should be given to the economic haulage distance from the collection area, proximity of highly developed and congested areas, cost of acquisition, probable future assessed valuation, cost of site preparation, seasonal wind directions, surrounding traffic conditions, existing zoning regulations, and public acceptance.

Readying the acquired site is the next step. Generally such site preparation can be executed profitably

● **PREPARATIONS for establishment of a sanitary fill in a lagoon includes construction of circumscribing dikes and essential trash screens for tidal drainage.**

and expeditiously by private contract. Its principal components consist of stockpiling suitable cover material in sufficient quantities for the whole job, or at least to last through winter operations; erecting proper drainage facilities, screens, tidegates, berms, fences, dikes, accessways, etc; demolition of condemned structures, removal of trees, etc; construction of temporary truck scales, housing and sanitary facilities; and, where necessary, extending water lines, electric lighting and telephone facilities. The extent and degree of these improvements depends on local conditions but generally they should conform to the following standard requirements:

Cover materials should be clean earth, relatively free of organic matter, tree roots or branches, large stones, bulky waste building materials and, if possible, with low clay content (maximum about 50%). These limitations are necessary to assure good, all weather traction, to safeguard against unequal settlement and heaving action, to discourage burrowing by rodents, thoroughly to blanket the putrifiables properly against insect breeding and scattering by birds, and to reduce surface cracking. Clean ashes or incinerator residue are permissible but only for the interim 6 in. working cover. Cost of procuring suitable cover, stockpiled on site by private contract, will range from $.30 to about $1.00 per cubic yard, depending on local conditions.

Final cover on the completed fill should have a compacted depth of 24 inches, including 6 ins. of top soil, as a permanent rodent and insect control, as a protection against odor and gas emissions, and in order to support normal grass or vegetation.

Except for depressed areas such as quarries, sites in the vicinity of built-up settlements or near travelled highways should be circumscribed by dirt berms, 8 to 10 feet high, to hide operations from public eye, and, if the filled area is to rise above adjoining lands or waters, to help filter out possible future leachings.

The berm should be topped by a continuous 8 foot high wire fence, with burlap covering where necessary, to confine wind blown debris and dust. In large fill areas this fence should be supplemented by the temporary erection of portable "snow" fences to catch papers blowing in the immediate vicinity of the dumping operation.

Tidal lands should be protected on the outshore sides by earth dikes designed to withstand erosive wave and tidal action. Inexpensive sheet pile cut-off walls may be necessary for added strength and to arrest excessive leaching action. Drainage culverts through the dikes should be of generous size, screened and equipped with tide gates.

A semi-portable shed or sheds should be located near the main entrance to the landfill for general operational headquarters and also to house the operating staff and labor. This housing should have heat, water, sewerage facilities, lighting, lockers and showers.

An adjoining semi-portable type weigh room with truck scale is essential to secure reliable management and cost statistics.

For relatively large fill areas a hard surfaced roadway, of semi-permanent construction, should be built from the point of entry to the dumping point. This all weather road, extended periodically to the open face, will speed up hauling operations but more importantly it will pay for itself several times over in reduced damage to the collection trucks and tires.

For night operations overhead lights should be installed along the access road and near the active bank. In some instances portable motor generator sets at the active bank may suffice.

Equipment and Personnel—Preplanning of operations requires a careful appraisal of personnel and equipment requirements, and the development of detailed plans and specifications of successive operational steps.

The type and number of pieces of equipment required will naturally vary with the size of the operation and other local conditions. The following is typical for an operation handling about 300 truck loads per 24 hours (15 cu. yds. each) with a 200 ft. wide by 20 ft. deep open space. This operation, sized for a municipality of 400,000 to 500,000 population, calls for the following type high capacity, rugged, equipment.

Item A—Two 20-ton bulldozers, diesel engine driven, crawler or pneumatic tire type. One to be used at the active area for pushing and distributing the truck piled refuse over the bank; the second for miscellaneous grading, covering, road building, fire fighting, etc. and as a standby unit.

Item B—Two 15 cu. yd. self loading, self dumping scrapers, each tractor drawn. Both of these will be required to dig and carry "cover" material from the stockpile to the dumping area and for continuous spreading and coverage of the freshly placed refuse. Where material must be cut from a distant borrow pit, these two units will need to be augmented by a power shovel and one or more dump trucks depending on the distance of haul. This power shovel will also be required for the construction of the necessary drainage ditches, berms, culverts, etc.

Item C—One street flusher or its equivalent for spraying deodorants and for fighting fires where nearby hydrants are unavailable.

The capital investment in the above type equipment for the specified size of operation approximates $200,000. For an amortized life of 7 years, this fixed cost reduces to about 15 mills per ton of refuse disposed. Smaller communities or smaller sized operations would gear down these equipment require-

Table 1—Costs of Refuse Fill in "Wet" Areas

Item	*Type 1 Wet Area*	*Type 2 Wet Area*
Total cost of site preparation including procurement of cover material by private contract	$1,078,800	$2,099,500
Total tons of refuse disposed	2,173,000	2,504,000
Unit cost of site preparation and cover (per ton of refuse)	0.50	0.84
Total cost of equipment used in fill operations by municipal forces	381,200	447,000
Unit cost of operating equipment (per ton of refuse)	0.18	0.17
Unit cost of municipal operations (per ton of refuse) including plant and equipment maintenance, supervision and administration, vacation and sick leave	0.83	0.90
Unit cost of municipal pension costs (per ton of refuse)	0.21	0.21
Total costs per ton of refuse (excluding interest on capital, costs of utilities and general city-wide administrative costs)	$1.72	$2.12

ments and capital costs. The amortization costs per unit of refuse, however, would be about the same.

That portion of the site near developed areas or much travelled highways should be filled during the cold months—the more remote portions should be reserved for the warm months. Dumping into waters should also be limited to the cold winter months. The active, dumping bank should be always faced away from prevailing seasonal winds so as to minimize litter nuisances and facilitate fire fighting. Where possible, the exposed, freshly placed fill should be placed away from public view. Dumping should be limited to relatively small areas or narrow strips so as to minimize the exposure and nuisances from the uncovered open face. The width of the dumping strip, however, should be adequate for efficient truck dumping, maneuvering, bulldozing and allied operations.

Dumped refuse should be promptly bulldozed over the open bank (operating platform) and the side slopes and surface covered as soon as possible with a 6-in. blanket of clean earth. The exposed open face should be similarly covered over inactive holidays and weekends. A deeper blanket in the immediate area of operation will unnecessarily reduce wheel traction. Areas covered in the preceding days operation should receive an additional 12 in. thick blanket of clean earth. On completing the fill and grading the whole area should be covered with a final blanket of 6 ins. of top soil to support natural vegetation, effectively seal the underlying refuse, and safeguard against surface cracks and erosions.

Fills should be completed to preplanned grades with due allowances for settlement. Surface grades of 1 to 2 percent are sufficient to help shed rainfalls without ponding. Maintenance of uniform grades is essential to eliminate surface pools with their potential noisome odors.

Layers of refuse should not exceed 15 to 20 ft. in depth after initial compaction. Deeper fills should be carried on in stages unless cover materials are very costly. Exposed refuse should be sprayed as necessary with suitable deodorants and larvicides, and as a dust control measure. Fires either in the open or previously compacted areas should be promptly extinguished. All heavy operating equipment such as collection trucks, tractor dozers, scrapers, etc. should be run uniformly and constantly near the operating bank so as to secure the benefit of uniform compaction over this area.

Wet Area Operations

In addition to the above general principles applicable to each of the three types of "wet" areas, the following essential steps are peculiar to each type:

Swampy or Marshy Areas. (Type 1) — Construct and maintain a drainage system in keeping with the programmed step by step filling operation and adequate to handle both the ground water run-off from the adjoining uplands, and the surface run-off from the newly filled plateaus. The discharge end of the ditches should be equipped with readily cleanable trash screens. If discharge is into tidal waters, the coarse screens should be supplemented with flap gates to control back flows.

Extend filling strips from a previously constructed operating platform. This initial platform, built up from either compacted refuse or other readily available material to a height of about 5 ft. above marsh elevation, facilitates maneuvering of vehicles and generally provides greater flexibility for subsequent operations.

Schedule and control filling operations so as to preclude, or at

(*Continued on page* 133)

● **TRACTOR and scraper spread cover materials over previously graded and compacted refuse, as seagulls watch.**

SURFACING

● CONCRETE pavement construction on a County road. Use of a Quad City slip form paver is illustrated here.

FOR LIGHT-TRAFFIC ROADS

C. ARTHUR ELLIOTT, Greene County Engineer, Jefferson, Iowa

OUR COUNTY, by its fortunate geographical location, was nearly covered by the Wisconsin Glacial Drift, and has enjoyed down through the years, the excellent gravel deposits left behind when this great ice sheet melted. Unfortunately, like many good things, these gravel deposits are not inexhaustible, and we are finding ourselves, like many of our neighbor counties, faced with a rapidly dwindling supply of surfacing materials.

More than 16 years ago, Greene County completed its program of placing every home on a surfaced road, and immediately started thinking of ways and means of affording some type of surface that would conserve our diminishing gravel deposits. The first step was by consolidation and compaction with the addition of clay and calcium chloride by our own county forces. At the outbreak of the second world war, Greene County had some 25 miles of chemically treated roads and we were definitely saving road gravel. During the war years, these roads went the way of most roads that required critical materials, and the program was dropped until 1946. After a post-war effort at chemical treatment on some of our heavier travelled roads, we completed by contract, in 1951, some 28 miles of stabilized chemically treated surfacing. These roads cost about $4,000 per mile and while they were conserving road metal, they were also affording us a base for a more permanent surfacing.

The Iowa Highway Commission constructed, in 1936, on Primary No. 25 here in Greene County, nine miles of what is known as Type "A" portland cement concrete pavement. The mix used in this pavement contained about 10 percent less cement than used in the standard type pavements. Also, the normal thicknesses of 7 inches and 10 inches were reduced to 6 inches and 8 inches. Other refinements, such as curbs, reinforcing steel, expansion joints, etc. were also eliminated. Many people were skeptical of reducing thicknesses and cement contents in our concrete pavements. Certainly, if those who designed this slab could have anticipated the 300-bushel loads of seed corn that have been pounding fifty miles an hour down this slab these past few years, they might have had less courage.

However, to everyone's great satisfaction, this Type "A" concrete has exceeded, I am sure, all expectations. After nearly 20 years of steadily increasing loads and traffic densities, this pavement is one of the finest pieces of concrete highway in Greene County.

As the years of excellent service accumulated on this section and Greene county's need for some sort of permanent surfacing became increasingly greater, we began wondering if larger reductions in thickness and cement contents might not be practical. However, since we were reluctant to get too involved in the research field as a county, we welcomed the formation of the Iowa Highway Research Board as an agency through which we might proceed.

Consequently, in 1950, Greene County submitted an application to the Iowa Highway Research Board for a joint project on "Thin Portland Cement Concrete for Light Traffic Roads". This project was predicated on the assumption that, regardless of the theories developed for computing the stresses in rigid pavements, the design of such slabs to withstand the effects of these stresses is largely empirical, particularly in the case of pavements subjected to relatively light traffic and infrequent heavy wheel loads, and where the consideration of initial cost might warrant the use of relatively low factors of safety".

The project was favorably received by the Research Board and the overall length of the pavement was set at two miles. These two miles of concrete were to be 20 feet wide, in three different thicknesses, 4½ inches, 5 inches and 5½ inches; the 4½-inch section in each mile was to be built half with 6x6 wire mesh reinforcement, and half with a 4-foot tie bar on 4-foot centers across the center line. This same 4-foot bar was to be the only reinforcement in all other sections. All sections were to be uniform in thickness except the outside foot which was to slope from the specified uniform thickness to the bottom of the 8-inch side form.

At the letting, the following low bids were received per sq. yd.: 4½-in. $3.04; 4½-in. with mesh $3.42; 5-in. $3.15; 5½-in. $3.26.

If the results of these bids were indicative, we had pretty well learned the answer. Since 4½ inches is only 75 percent of 6 inches, then if 6 inches of concrete is worth $3.38 per square yard, 4½ inches should cost only $2.54 instead of the $3.04 bid. However, the costs of subgrade preparation, form setting, finishing and curing are practically the same for a 4-inch slab as for a greater thickness.

I should like now to go back to early spring of 1951, and say that through the spring break-up (and it was a dandy) many load bearing tests were made on this two-mile stretch of road by crews from the Iowa Highway Commission in areas of apparent subgrade weakness, some of which showed subsurface water immediately under the road surface. The load tests were conducted for the most part by the plate bearing method, although many were checked against the subgrade resistance test. Results indicated bearing values from a high of 58½ pounds psi to a low of 11½ psi. We considered 30 to 35 psi as being adequate.

Test Results

Soil borings were also taken in conjunction with these load bearing tests and the soil classified to a depth of 4 to 6 feet. Moisture percentages and general conditions were also recorded in detail in these test sections. All areas showing a high water table, and soils which indicated high moisture susceptibility, were scheduled for vertical sand drainage as a means of preventing frost-boil action after construction of the pavement.

A summary of these plate bearing tests showed a total of 4,100 lineal feet of unstable base and these areas were treated with a total of 4,064 vertical sand drains 7 inches in diameter and 6 feet deep. These drains were drilled with a mechanical auger on 5-foot centers in five parallel lines, with the spacing staggered checkerboard fashion. The holes were back-filled with washed sand and a solution of calcium chloride and water. A mechanical vibrator was used to settle and compact the sand and chloride solution, and proved a very necessary part of the procedure.

The theory of these sand drains is that ground water is afforded an easier and faster avenue for raising and lowering during the spring fluctuation in moisture; and that planes of weakness are introduced in the ice films that are formed during these freezing and thawing cycles. In spite of two rather severe spring break-ups, there have been only minor indications of distress in these treated areas.

Actual paving operations were started September 7, 1951, by Booth & Olson Company, contractors, and the slab completed some three weeks later. A crack survey was made each morning of the previous day's pour, and additional surveys over the entire two miles a month later after the pavement had been under normal traffic for two weeks. Crack surveys have been continued at 90-day intervals for the past several years. We were surprised to learn that there were only 10 percent more cracks at the end of the first 30-day period than there were the morning after the slab was poured. From this survey, we are convinced that our present day curing methods leave much to be desired if we are concerned about early contraction weaknesses. Incidentally, from data compiled by the Iowa Highway Commission on the aggregates used in this pavement, we may expect an ultimate crack frequency of approximately 16 feet. However, after four years of continuous use, we are still a considerable distance from this 16-foot frequency.

It is of course too early to form many definite opinions of this experimental pavement. We have been pleasantly surprised at the way it has come through two bad springs. We are still more pleased with its apparent strength under such traffic as the hauling of 70,000 tons of base material over the two miles in a 30-day period the past summer. Certainly, 4½-inch concrete does not possess inherent beam strength sufficient to support even light traffic, without an adequate base. In fact, 4½ inches of any road metal is only as good as the base upon which it is placed.

The Slip-Form Paver

With a firm conviction that Greene County should continue with a "hard surfacing" program, and with these two experimental miles as a background, we let four additional miles of 6-inch portland cement pavement in 1954. These four miles were to be constructed with a slip-form paving machine developed and built by James Johnson of the Iowa Highway Commission. However, winter caught the contractor and only the first two-mile project was completed in 1954. We believe these to be the first two miles of exposed concrete surfacing ever placed without fixed side forms.

Andrews Concrete Products Company of Mason City, Iowa, was the contractor on these four miles and the bid of $2.22 per square yard made a total cost of slightly over $27,000 per mile. The slab was constructed in two 10-foot parallel strips with the space between slabs filled with concrete, giving a finished width of about 20 feet 6 inches. The slab was laid directly over the old gravel surface which consisted, in addition to the original gravel, of a 4-inch stabilized surface treatment of clay, gravel and calcium chloride. Subgrade preparation consisted of scarifying this gravel base, adding optimum moisture and rolling back to at least 95 percent Proctor density. Final grade was obtained by a skilled motor patrol operator, and the crown was checked by template.

This Johnson paver lays a concrete slab 6 inches thick without the use of fixed side forms, and is a

● **FINISHED edge of a pavement slab that was laid with a slip form paver.**

finishing machine, concrete spreader, bull float and finisher all in one package. The wet concrete is dumped into a hopper at the front of the machine and is extruded behind, much the same as toothpaste is dispensed, with the aid of a mechanical vibrator and the traction of the drive wheels. The machine is capable of digesting the wet concrete about as fast as it can be dumped, and can work at speeds of 25 feet per minute. However, mixing capacity governs the rate of operation and some 1,800 feet was the maximum effort for a ten-hour day.

The advent of this method of laying concrete paving has been stimulating and several machines have been developed, or are in the process of development, using this pilot machine as an inspiration. The patent rights to the Johnson paver have been sold to Blaw-Knox Company of Pittsburgh, Pa., whom I understand contemplate a full width monolithic design. Certainly, Mr. Johnson and his assistants deserve great credit for bringing forth the original slip-form paver.

Among the other interests developing the slip-form paving operation has been the Quad-City Equipment Company of Rock Island, Ill. Three of their machines have been in operation in three different counties of Iowa this season. Here in Greene County, the Hallette Construction Company of Crosby, Minnesota, has completed the second four-mile project using the Quad-City Slip-Form paver.

When these twelve miles of 6-inch concrete pavement were let, an option was given of using a modified conventional method of concrete placement, or placement by a slip-form paver. If a slip-form machine were used, the concrete had to be laid in a single pass to the full width of 20 feet, with the concrete vibrated or tamped with an approved mechanical tamper, and finished with one transverse belting followed by a wet burlap drawn over the finished surface in a longitudinal direction. The slab was to be finished to a tolerance of 3/16 inch as checked by a ten-foot straight edge; subgrade preparation was to consist of scarifying, mixing to optimum moisture, spreading and rolling until compacted to the satisfaction of the engineer. Proctor densities were not to be taken. Final subgrade finish was required to be true to grade and cross-section, and to the degree of smoothness equal to that obtained with a motor patrol operated under favorable conditions by a skilled operator.

Bituminous or subgrade paper was not required, but the grade had to be wet ½ inch deep ahead of the placing of the concrete. The only steel reinforcement was 3-foot tiebars on 3-foot centers across the center of the slab on two superelevated curve sections. Curing was to be either an impervious coating material producing a white finish, applied immediately after the concrete is finished; curing paper applied as soon after finish as possible without marring the surface; or sheets of polyethylene in lieu of the curing paper. Transverse contraction joints were to be sawed at 80-foot intervals to a depth of 1½ inches within 24 hours after placing of the concrete. The contractor is not required to seal these joints.

Hallette Construction Company was the successful bidder on the twelve miles at a price of $2.36 per square yard and 25¢ per lineal foot for sawing any additional joints other than those listed in the letting. Laying concrete started the first week in July. Progress was immediately evident as dependent on the capacity of the 27E Koehring mixer, and just under 1600 feet in eleven hours has been top production. Like the Johnson machine, the Quad-City Paver is able to handle the concrete much faster than most conventional mixers can deliver; and yet, the best operation of the slip-form paver is achieved with constant forward motion. Only 23 working days were required for the first 4½ miles.

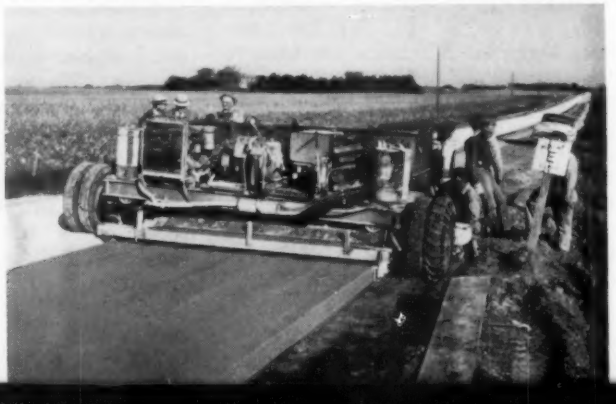
Since the first project is now open to traffic, we have been able to compare the riding qualities with other slabs in the county. While we are not completely satisfied with the riding surface of the first section of the job, there is definite improvement in the last half. Though our checking with a rolling straightedge showed less than a bump per one hundred foot station, a bumpometer test shows a reading of approximately 122 inches of bumps per mile. Apparently, riding qualities in slip-form paving is not determined by tolerances within 10-foot limits. However, we feel our surface finish is improving and are anxious to ride the section now under construction. As an experiment, our checking straight-edge is now set at ⅛ inch tolerance and we are not finding an excess of bumps. In comparison, our first two miles poured with the Johnson machine shows 136 inches of bumps per mile, our experimental two miles an average of 106 inches and a recent resurfacing Primary Road job, placed with conventional methods, an average of 95 inches per mile.

Our limited experience to date has convinced us that different crews get different and varied results with the same materials used in the same type machine. Skilled inspectors, skilled workmen and proper attitudes are usually the difference between good and mediocre construction, and there isn't a great deal that can be substituted for experience. Reduced cement contents, reduced thicknesses and reduced operating costs must still produce a smooth surface if the public is to buy the finished product.

We, in Greene County, feel we are making progress in providing means of conserving our dwindling natural surfacing materials. We are not convinced that we have found the perfect solution; but we expect to go forward with additional paving projects.

● **SUB-GRADE** machine, developed by Quad-City is being used in preparation of a subgrade for later hard surface.

● **ONE OF THE FIRST** slip-form paving machines built by James Johnson shown in operation on a county road in Iowa.



DR. J. C. DUFF, M. D.,

Mayor of Anson, Texas

HOW WE KEEP OUR CITY WET

WE HAVE a growing city, thriving in the West Central Texas range and oil country. Anson is a fortunate city because for many years the town's ample water supply came from South Lake. Water was plentiful but soon the growing population put city officials to thinking, "what if South Lake should go dry?"

This forward thinking led to planning and then action. A new lake was readied north of town. This lake supplied Anson with water for 11 years . . . until this year . . . when very little rain fell on the North Lake watershed. However, the lake was used until only a few days' supply was left. When it was obvious that North Lake could no longer service the city, we planned to switch to the good supply in South Lake. Pumps were turned on and the water began to flow, except there was not enough water going through the line to take care of the city during peak usage.

Pumps, valves, and the line were carefully checked and we found that the line's throughput had been cut in half by deposition, scaling and corrosion.

Replacing the 8,778 ft. of 6-in. cast iron line was impossible because of the high cost. So we contacted the Pipelife Corporation. The Pipelife process is a newly developed plastic coating method for coating pipelines internally and in place. Very quickly equipment was moved into town; mobile units were immediately set up; and the entire 8,778 ft. of line were internally cleaned and coated in 3½ days.

Immediately our throughput was increased 152 percent. Previous line capacity was 213 gallons per minute with 105 psi pumping pressure. The newly coated line delivers 535 gallons per minute with a pumping pressure of 61 psi.

Another civic problem was solved inexpensively and permanently. Water rationing, restrictions on car washing, and lawn watering were not necessary. We can now be the "wettest town in Texas" by turning a valve.

● **CLEANING** of the line was a first step in restoring capacity to normal.

● **COATING** procedure called for the use of a special coating plug, shown here being checked before inserting it into the pipe line. All work was done in 3½ days.

● **SPECIAL** coating material being inserted in pipe line; flow increased 152%.

NEW HORIZONS IN

BERNE A. SCHEPMAN, **Director, Testing Laboratory, Research and**

IF IT WERE possible to bring into focus the "modern sludge disposal plant" of 1980, it undoubtedly would reveal some radically different processes and equipment from those in use today. It is not our intention to assume the role of a seer and predict definitively how plants will operate in the future. However, a look toward the horizon with due consideration to the factors influencing the selection of the proper methods of sludge disposal does reveal certain definite trends.

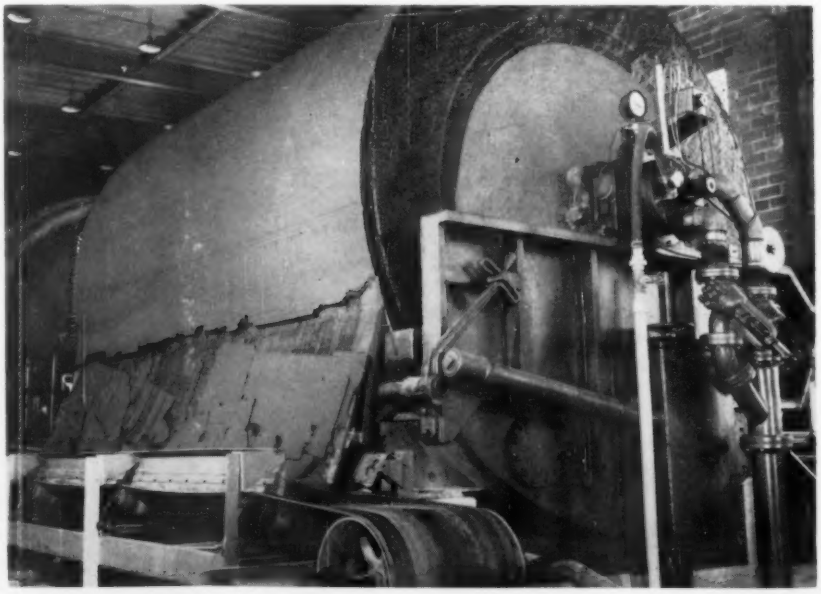
In the past 25 years much progress has been made in improving the methods for disposal and utilization of sewage sludge. The technical advances have been directed toward more sanitary, economical, efficient and esthetic disposal methods. Greater emphasis has been placed upon the utilization of sewage sludge as a soil conditioner and plant food. All of this has resulted in trends toward more economical and pleasing solutions to an important community problem. The trends can be expected to continue with the cooperation and help of state or municipal officials, universities and technical groups, and the manufacturers marketing equipment in this field.

Almost all of the methods of sludge disposal used today were known in 1930. Sewage sludge was, and still is, discharged directly into streams, bodies of water or lagoons in some areas. Many plants built in that long-ago period still spread the concentrated sludge upon cultivated land or dewater it in drying beds. These practices are decreasing, however, with more emphasis now being placed on mechanical processing methods. Most new plants are installing rotary vacuum filters and many are including sludge dryers or incinerators. Older plants also are being modernized, as this equipment has many advantages and makes sludge disposal an efficient, well-controlled process similar to those employed in other modern industries.

In analyzing the reasons for these changes and in predicting the directions sludge disposal will take in the future, it is well to examine the factors which control the selection of the disposal method for a particular installation. The primary consideration must be to provide a safe and sanitary means for disposal of the sludge. This requirement must be met, and other factors are to some extent secondary. The specification of the methods which meet this requirement is sometimes indefinite, but generally laws governing the area involved define the practices which are acceptable. In some states there is still a lack of legal authority in this field and all that a State Board of Health (or the group responsible for this control) can do is to make recommendations. However, this is becoming less prevalent and it is certain that in the future sludge disposal methods will be controlled closely in relationship to the local conditions that prevail.

After the sanitary requirements are fulfilled, the most important considerations in selecting the sludge disposal method are the installation and operating costs of the equipment in the plant. The municipal or consulting engineers who have the responsibility for making the selection of the disposal method must keep the cost within the taxpayer's means. If careful planning and control are exerted, these situations can be minimized and better utilization of the available funds is accomplished.

Many of the cost factors have changed appreciably in the last few years. Labor costs have increased steadily and many plants now are installing mechanical equipment rather than incur the high costs of manually handling the sludge solids. Numerous cities have replaced drying beds with vacuum filters due to the high labor costs and others are including flash dryers or incinerators to further reduce manual handling. Because of these changes it is



● **CLOTH COVERED filter, 11 ft. 6 ins. diameter and 14-ft. face, at Ashbridges Bay Plant, Toronto, Canada, is shown above operating on digested elutriated sludge.**

SLUDGE DISPOSAL

Development Department, the Eimco Corporation, Palatine, Illinois

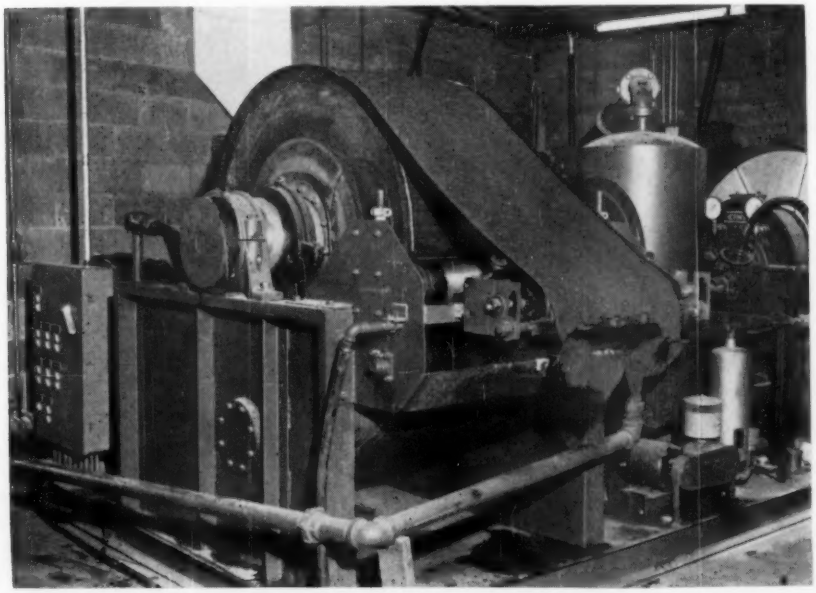
obvious that all of the items in a plant's cost picture must be analyzed closely in light of current trends in making the proper selection of the sludge disposal method.

Another vital consideration in the selection of the proper method of sludge disposal is the location of the sewage treatment and sludge disposal plant. Most of our municipalities are expanding rapidly to accommodate our booming population. Fewer farmers and farm workers are required every year in spite of the increased demand for food products. This means that more people are living in our urban areas and that the plant located on the edge of town, or even a few miles from it, may soon be in a desirable area for home development. Odors, insects, and unsightly sludge facilities sharply decrease the value of the property, thereby reducing the available tax funds of the area Cities often are faced with court actions which are embarrassing, if not costly, in delays and altered plans. Because of the importance of this factor, municipalities are going to mechanical methods of sludge disposal in increasing numbers every year.

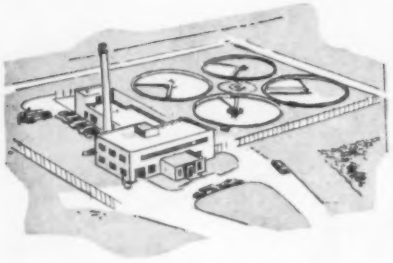
A fourth factor in sludge disposal is the potential value of the sludge as a soil conditioner and source of plant food. Most cities have not made an extensive effort to sell their sludge to the surrounding community on the basis of its value to the soil. Much work has been done toward the evaluation of sludge as an aid to crop growth, but as yet many cities do not give sufficient consideration to this aspect of sludge disposal in designing their sludge handling facilities. There are areas in the United States where sludge is being pumped directly into streams or bodies of water, lagooned or used for sanitary land fill while fruit or vegetable growers within sight of the disposal plant are purchasing fertilizer for their farms. The sludge undoubtedly would not meet all of the requirements of these farmers, but it certainly would supply excellent humus for soil conditioning, many of the trace elements not present in most commercial fertilizers, and some of the nitrogen, phosphorus and potash that is being purchased commercially. This occurs because the cities either do not make known to the nearby farmers the value of their sludge or because the sewage treatment facilities were not designed to condition properly the sludge for use on the soil.

Often the cost of the facilities for treating the sludge so that the solids can be used as a soil food is considered to be excessive, but the value of the sludge to the soil generally is not taken into account in these calculations. The common values placed on nitrogen, phosphorus and potash as fertilizer are 20c per lb., 10c per lb. and 5c per lb. respectively. Using this basis, the average activated sludge would be worth about $20.00 per ton and primary-digested sludge about $11.00 per ton. (These figures are based on sludge with 5% moisture). It is difficult to sell the dried sludge for these prices in many areas, but part of this is due to the lack of real sales effort. By pointing out the value of these fertilizer elements, the bonus value of their slow leaching properties and the humus and soil conditioning characteristics of the sludge, the farmers are more easily sold this valuable product. The return from these sales shifts the economic balance much more favorably toward the installation of sludge dewatering and drying equipment.

Typical of the investigations at the universities contributing to the technology of sludge disposal is the work being done at Michigan State College under the direction of Dr. John R. Snell, Chairman of the Department of Civil and Sanitary Engineering. These studies are designed to investigate the fundamental variables controlling high rate composting of raw organic



● **ROTOBELT sludge filter at Michigan State-East Lansing plant, used for experimental work by the college and city, is operating here on primary activated sludge.**



wastes such as sewage sludge or garbage. Studies already have been completed on ground composting of sewage sludge and have proven to be highly successful. A rotary vacuum filter is installed with the high rate composter at the East Lansing — Michigan State College Sewage Treatment Plant and additional studies are being completed on the high rate composting of sewage sludge. This process will provide an efficient, sanitary method of treatment and disposal of the sludge, as well as returning the valuable wastes to the soil. Work also is being done in other cities and universities along these same lines, and it is certain that in the very near future the successful high rate composting of sewage sludge will be accomplished and design data available for large and small municipalities.

In conjunction with this work at Michigan State, the sludge filtration studies that had been conducted at Waterbury, Connecticut, and Fond du Lac, Wisconsin, were continued. The program was designed to determine the most economical filter installation for any type of sludge. The various new flocculating agents were compared with ferric chloride and lime, new permanent filter media were tested and all of the controllable operating variables were analyzed for their effect on filtration rate and cake moisture.

Based on the data collected at these three plants, several definite filter operating principles were formulated. These are:

1. The rate of sludge cake formation decreases sharply after 0.5 to 0.75 minute for most sludges; therefore, optimum rates are obtained when (a) the drum submergence is 20 to 25 percent of the filter cycle: and (b) the filter drum is operated so that a cake no thicker than is required for good discharge is formed. (This also allows the maximum moisture reduction in the cake).

2. The rate of sludge cake formation increases about 30 percent for primary-activated sludges and up to 60 percent for primary-raw sludges when the pick-up vacuum is increased from 10″ Hg to 20-25″ Hg; therefore, 20-25″ Hg vacuum should be maintained to obtain maximum rates. (This results in essentially no increase in horsepower requirements because very little air is drawn through the filter during cake pick-up.

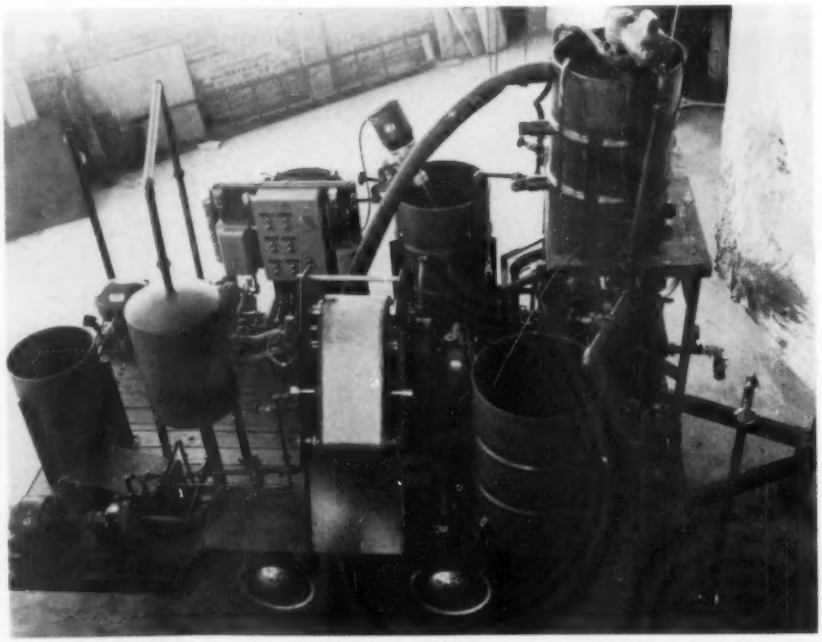
3. Sludge filtration rates increase almost linearly with the solids concentration in the feed; therefore, careful consideration should always be given to minimize plant investment and operating costs by considering the optimum thickener-filter installation.

4. Average sludge filtration rates can be increased from 25 percent to more than 100 percent with the use of a permanent type of metal media which is self-cleaning and has facilities for washing during operation. Some reduction in chemical flocculation also can be obtained with identical filtration rates.

5. Reductions in cake moisture of from 5 to 10 percent can be obtained by operating at 20-25″ Hg vacuum vs. 10-12″ Hg vacuum with all other operating conditions held constant.

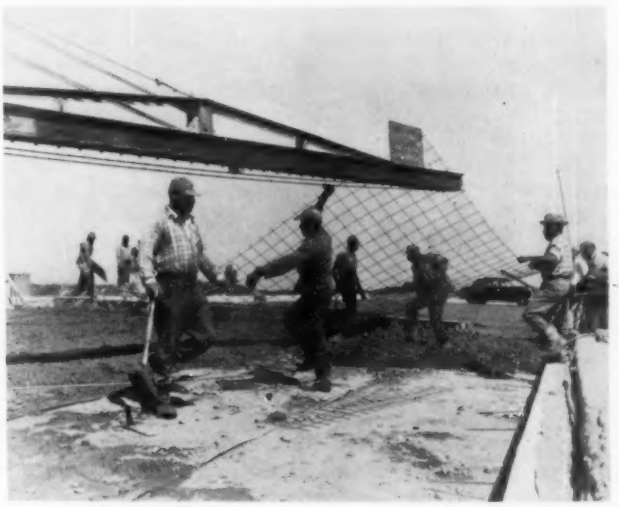
To confirm the conclusions drawn from these tests and compare the filtration characteristics of different sludges, a special portable test unit has been constructed. The unit is actually a complete filtration station and allows a valid comparison of results at different plants because the identical media and equipment are used. The results obtained with the unit have shown conclusively that these principles were correct. For example, at a plant filtering digested elutriated sludge, filtration rates with the filter designed and operated on these principles were from 56 percent to 79 percent higher while the cake moisture was from 2 to 4 percentages lower than obtained on the existing cloth covered filters. An 18 percent reduction in flocculant was also obtained, thereby clearly indicating the cost reductions that can be obtained with proper filter design and operation. This test work will continue as new flocculants and sludge processes are developed so that the optimum filter station design is assured.

Work also is being carried out by the various manufacturers of sludge drying equipment to reduce their initial and operating costs as well as to insure better equipment performance. A good example of the results of this work has been the design of a deodorizer for stack gases which eliminates completely and economically the odor from the liquid in the sludge cake. As a result of this combined work, cheaper sludge disposal for all municipalities will be possible; and, in addition, more of the organic wastes will be returned to the soil. It safely can be concluded, therefore, that the modern sludge disposal plant of the future will be similar to other process plant operations and will operate efficiently, economically and for the betterment of the entire community. Our country's farm areas will benefit from the organic soil food and our urban areas will have more desirable living at a lower cost.



● **PILOT PLANT sludge filter consists of 18 x 12-in. Rotobelt filter, mix tank, sludge pump, feeders, vacuum pump, receiver, filtrate pump, wiring and pipes.**

● **BLACK COLORED** Portland cement concrete of the service roadway at right harmonizes with asphalt covered streets. Natural concrete delineates bus stop and connecting drive.



● **WORKERS** place sheet of 50-lb. welded wire fabric on a freshly poured concrete base which will later be topped with asphalt. Building paper over subsoil acts as vapor barrier.

PAVEMENT ENGINEERING PRACTICE IN THE DISTRICT OF COLUMBIA

SHEET ASPHALT, over a steel reinforced concrete base, has been adopted as a standard for blacktop construction in the District of Columbia. Nearly 380 miles of District streets have been built to these specifications. The reason the District of Columbia more or less specializes on black surfaced pavement is, however, somewhat happenstance. As Washington, back in the 1920's, began to grow, more and more wooden block, brick and cobblestone streets were surfaced with bituminous material to provide a smoother-riding surface.

With a network of blacktop roads and streets spreading out from the center of the city, it then became a matter of appearance or esthetics to match new construction to the existing pavements. Such esthetic considerations were felt to be particularly important in furnishing the proper setting for the many federal buildings and monumental structures in Washington. This principle of harmonizing pavement appearance still governs much of the District's construction. It is adhered to even in building concrete pavements, particularly in the downtown area. For example, due to extremely heavy concentrations of traffic on such facilities as service roadways, portland cement concrete sometimes is specified, and, a blackening agent is added to the mix so that the completed pavement matches in appearance the adjoining blacktop.

With the historical precedent of black surface pavements thus established, the next step was to reduce or eliminate surface cracking in them. Mostly this can be traced directly to cracks in the base, so District engineers early concentrated on designing and building a better base. Instead of adding to the thickness of the topping in an effort to control the appearance of cracks, they considered the asphalt only as a seal and cushion, devoid of structural strength in itself. They reasoned that a portland cement concrete base should be built to the same general specifications as a finished concrete pavement because it is subject to essentially the same overall stresses despite its covering of asphalt. Thus, instead of using a low cement content, concrete pavement bases were made with more cement to minimize cracking and attain greater strength and durability. Steel welded wire fabric reinforcement was specified to distribute initial stress in the slab, reduce cracking, hold together tightly any cracks which formed, and counter stress-producing (failure-inducing) conditions.

District engineers found that the following stress-producing conditions often exist in portland cement concrete bases, even although covered with asphalt topping.

1) Initial Shrinkage — Incipient cracking from initial shrinkage is often the source of subsequent structural failure. Welded wire fabric distributes these initial shrinkage stresses and prevents this type of cracking.

2) Temperature and Moisture Variations—Temperature and moisture variations cause expansion and contraction of the concrete slab and subgrade friction resulting from this movement may produce critical tensile stresses.

3) Non-Uniform Sub-Grade Support — Non-uniform subgrade support caused by settlement of backfilled trenches or fill sections creates critical stresses in the concrete pavement. Means must be provided for transferring wheel loads across any cracks which may occur in the old pavement.

4) Traffic Loads—Where super-

imposed excessive traffic loads have caused structural failures in the pavement slab, reinforcement prevents opening of the cracks and minimizes infiltration of water and inert materials into the opening.

In the District's search for a better base, one that would withstand these stresses and permit fewer cracks in the asphalt surfacing, experiments were conducted relating reinforcement and transverse planes of weakness in the base to the appearance of cracks in the surface. These experiments, augmented by field work, led to the adoption of fabric reinforcement as an integral part of the District design, because it was found that a comparatively small amount of steel is excellent insurance against structural failure of the base because it increases the strength of the concrete slab approximately one third.

If any of the stress-producing conditions enumerated previously result in cracked concrete, the wire fabric holds the crack edges tightly together so that they function structurally as one, and the traffic load is carried on both edges instead of one. Obviously, the reduction and prevention of movement of cracks in the base eliminates a corresponding reflected crack in the topping above.

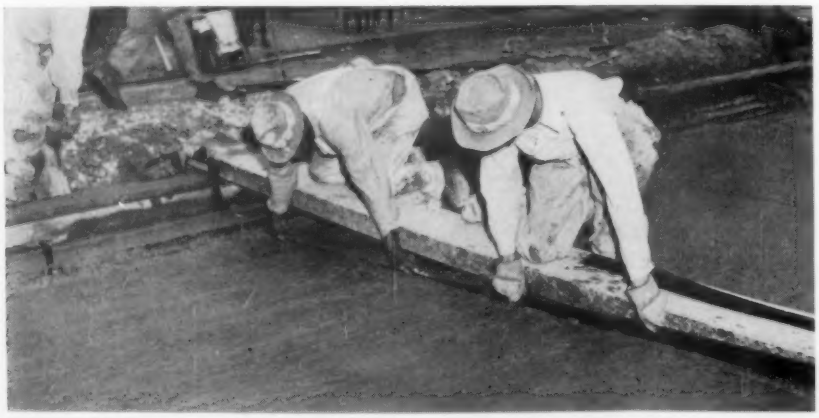
At the present time, the specific design for asphalt-over-reinforced concrete base pavement is as follows: Portland cement concrete is poured 6 inches thick and struck off; then 50-lb. welded wire fabric reinforcing is placed and topped by another 2 inches of concrete. Planes of weakness are formed in the concrete every 12½ feet by grooving the still plastic mix four inches deep and filling the groove with a double fold of tough building paper, or similar rigid material. After the concrete has cured, the topping of 2¼ inches of binder and sheet asphalt is placed.

In construction of reinforced concrete pavement bases in colder weather (under 50 degrees) expansion joints are provided every 300 feet in order to allow for expansion of the slabs in summer weather.

In addition to new construction of asphalt-over-reinforced concrete base, older concrete pavements often are resurfaced with blacktop. To prevent the formation of surface reflection cracks over random cracks in the older base, the District has experimented rather extensively with the use of welded wire fabric reinforcement of the asphalt topping with notable success.

Aside from the asphalt-over-reinforced concrete base construction, the District also constructs pavement of more conventional reinforced portland cement concrete. To date there are 240 miles of such pavement, some colored black to match existing pavement, and some in natural concrete color. The design for this type of pavement calls for 30-ft. slabs, 8 ins. thick; the use of 50-pound welded wire fabric, tie bars at all construction joints and load transfer devices across all transverse contraction and expansion joints.

Reinforcing fabric is also employed in the District around all structures such as manholes, storm sewer inlets and utility poles. These projections through the concrete pavement tend to interrupt the slab's continuity. A two-yard square sheet of lightweight fabric (20 lbs.) is cut to fit and centered around the obstruction in the pavement; location in the slab is as for pavement. The use of this reinforcement has practically eliminated cracks around such structures, previously a source of many pavement failures.



● **PLANE of weakness being installed, using bituminous impregnated inert materials, to permit cracks to occur along predetermined lines between fabric sections.**

Friction Losses in Corrugated Metal Pipe

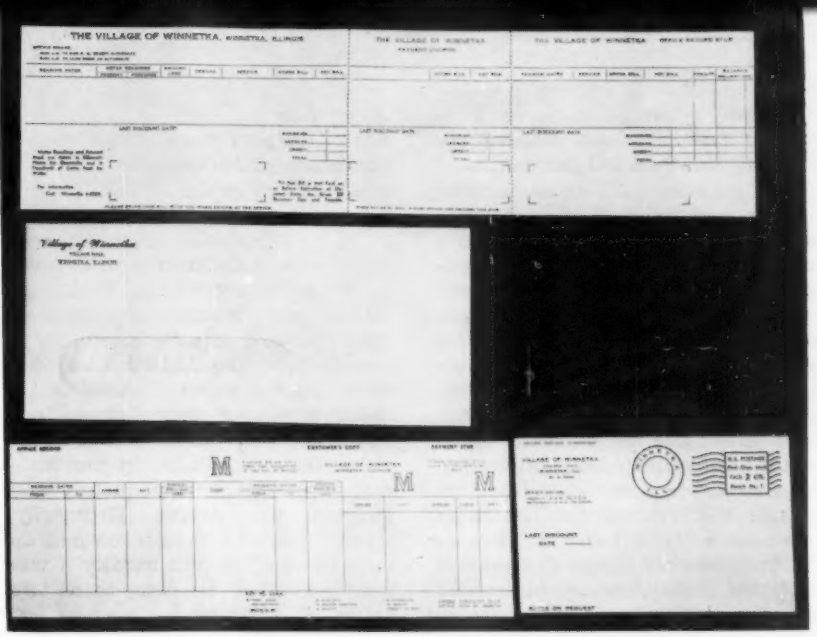
THIS is a study by the U. S. Army, Corps of Engineers, Portland District, at the Bonneville Hydraulic Laboratory which was reported in Highway Research Abstracts, October 1955. The purpose of this study was to determine friction factors for 3, 5 and 7-foot diameter corrugated metal pipe, as indicated by head-loss measurements for a range of velocities up to approximately 10 fps. for 5 and 7-foot pipe and 16 fps. for 3-foot pipe. Tests were conducted on new, straight, corrugated pipe.

Water from the forebay pool of Bonneville Dam was supplied to the test section through 6-foot smooth pipe. From the test section it flowed into a metering section where the quantity of flow was measured by means of a paralleled system of flat-pipe orifices; it was discharged into the Columbia River below Bonneville Dam through gate-valve controls and short outlet pipes.

The results of the study indicate that a close correlation existed between Reynolds numbers and both Darcy's friction coefficient (f) and Mannings roughness coefficient (n) throughout the range of experimental discharges reproduced for study. The following values of Mannings coefficient (n) were obtained from tests on pipes flowing full: Standard 3, 5 and 7-foot pipe had a value of (n) of 0.024; a 25 percent paved 5 and 7-foot pipe had an (n) of 0.021; a 50 percent paved 5-foot pipe had an (n) of 0.018.

The value of Mannings (n) remained almost constant at 0.024 during observations of open-channel flow in unpaved corrugated metal pipe 3 and 5-feet in diameter that were laid on a slope of 0.005. Values of (n) for 5-foot diameter pipe having paved inverts varied with the percent of paving and the depth of flowing water in the test pipe which was laid on a slope of 0.002. The following values were obtained for different depths of flow in the 5-foot pipe flowing at different depths: At a depth of flow of 0.75 ft. in an invert paved for 25 percent of the pipe, the coefficient (n) was 0.0110 (estimated); flowing 2.0 ft. full in an invert paved 25 percent, (n) was 0.0165; and in an invert paved 50 percent at the same depth of flow (n) was 0.0110 (estimated); at a depth of 4.0 feet in an invert paved 25 percent, (n) was 0.0205; and in an invert paved 50 percent at same depth of flow (n) was 0.0160.

NEW UTILITY BILLING SYSTEM *CUTS COSTS*



● **OLD utility bill is shown above and the new one is at bottom of illustration. Change from envelope, center, to postcard, lower right, reduced mailing cost 1 cent.**

PHIL HIRSCH

BY REVAMPING its utility billing system, Winnetka, Ill., near Chicago, has cut costs about $3,700 a year. Formerly, the 8.43 square mile village and a nearby unincorporated area, Indian Hill, were divided into three billing districts. Each month, one district received electric and water bills, while the other two received only electric bills. Statements were turned out on a National Cash Register Model AH-22810 (101) billing machine, and mailed in window-type envelopes.

Now, the village's 3,585 electric meters and 3,450 water meters are divided into two districts, explained Finance Director Robert Weidaw. Each district receives water and electric bills every other month, printed on the back of a postcard bill by an NCR Model 22015 (112B) billing machine. Cost of the unit was $6,000.

The new machine has assumed one bill processing step that formerly had to be done manually. Under the old system, before "present consumption," "past consumption," and "amount used" figures could be printed on the statement, a billing clerk had to verify them by picking up the first two figures from each customer's meter sheet, subtracting them on a calculator, and checking the answer with the consumption figure shown on the record. This step required approximately two hours per meter book. There were about four books per district.

All three figures are now simultaneously entered in the new NCR, which then automatically subtracts the first two, and if the answer doesn't agree with the third one, the machine locks and refuses to print.

Formerly, bills had to be made out for each district on separate dates, since it took the meter reader a month to cover the entire village, and the finance office staff wasn't large enough to process all accounts at once. As a result, Weidaw explained, a part of the staff was permanently occupied with payments made across the counter and sent in by mail.

With three mailings, three discount periods were necessary. (Winnetka utility customers get 15 days to pay the net bill, after which they are charged a gross amount). The discount date was printed by a plate inserted in an addressograph machine which also printed the customer's name. Occasionally, the clerk operating the machine would forget to change the plate, and several bill forms would be ruined, said Weidaw. Since only one discount date per month is required now, this problem has been eliminated.

Utility statements formerly were sent out on the 10th, 20th, and last of each month. Many customers had already paid their other routine expenses by the time their utility bills arrived. As a result, they would delay payment, and in a large number of cases inadvertently forget about it. Before the change to the new billing plan, the finance office had to send out about 450 past-due notices per month. Now, all utility bills are mailed on the last day of each

● **NEW NCR billing machine was a key factor in reducing billing and handling costs as much as $3,700 per year.**

month, and past due notices are down to less than 200 per month.

A change in the format of these notices has reduced clerical labor further. The village had been sending out two notices—one at the expiration of the 15-day period, another five days later notifying each delinquent customer that service would be discontinued unless payment was received by a given date. On both forms, charges for electricity, water, and supplemental services (usually lamp bulb purchases, or ash or commercial refuse removal) were itemized. The same two notices are still sent out, but on the first one only a total amount due is shown. Today, instead of sending out about 450 itemized bills per month, the village now has to itemize less than 25.

For the customer, the new billing system has two big advantages—both of which have been mentioned frequently by villagers paying their bills at the finance office. One is the reduction in the number of bills received per year. Instead of 12, each user now receives only six. With fewer checks to make out, he saves time and bank charges. Also, under village law, the utility customer can pay two bills per year after the 15-day period and still receive a discount. With half as many bills involved, he pays the gross bill only four times a year at most, instead of 10 times.

Changing the format of the utility bill produced a major cost saving. The old statement was a three-part form measuring 15 in. long by 4 in. wide. One part was an office record, one accompanied payment, and one was retained by the customer. After bill preparation, the office stub had to be detached; the other two sections were folded and then inserted in the window envelope. Final step was to seal the flap and affix postage. The task required the labor of one clerk for about half a day per district.

The envelopes were stamped in a Pitney-Bowes postal meter machine. Because of the flap construction, envelopes tore frequently and jammed the device. Ordinarily, stamping should have taken half an hour per district. But usually it was not completed in less than two hours.

The new bill eliminated use of the postal meter machine and almost all of the folding and inserting operation. The postcard retains the same three sections but measures only 10½ by 3½ in. The two sections sent to the customer are printed on the back. About all that has to be done before mailing is to tear off the office copy section, attached to the postcard by a perforated strip.

Before the changeover, about 4,000 bills were mailed per month. Envelope mailing cost was three cents per bill, or a total of about $120 per month. Now, only 2,000 bills are sent out each month, and the charge—two cents for each—comes to only $40.

By eliminating manual verification of meter consumption figures, reducing the folding and inserting job, and shortening the period during which the office staff is primarily occupied with payments, Winnetka officials have been able to reduce the finance department's three-worker billing section to two. This cut has lowered salary costs approximately $2,700 a year.

Converting from a three-district to a two-district system has freed the village meter reader for other duties (repairing meters, mainly). In the long run he covers as much ground, but now his work is more concentrated. For, instead of visiting all of Winnetka's 3,585 electric meters and one-third of the 3,450 water meters every month, he reads half of both in the same period—checking a total of about 3,500 meters instead of the 4,800 he visited formerly. There is a saving in travel time too, since he's reading two meters instead of one at a larger percentage of stops.

The new system has been in use since October, 1953. Introduction was preceded by newspaper articles which stressed the benefits to customers (fewer bills, fewer trips to village hall to pay them) and explained how the new procedure would work. Inserts accompanying bills sent out in September, 1953, together with signs placed on the finance office payment counter, disseminated similar information.

Only major disadvantage of the new system is that there's less printing space on the postcard bill than on the previous envelope bill. For approximately 100 accounts, this means that two bills have to be prepared instead of one.

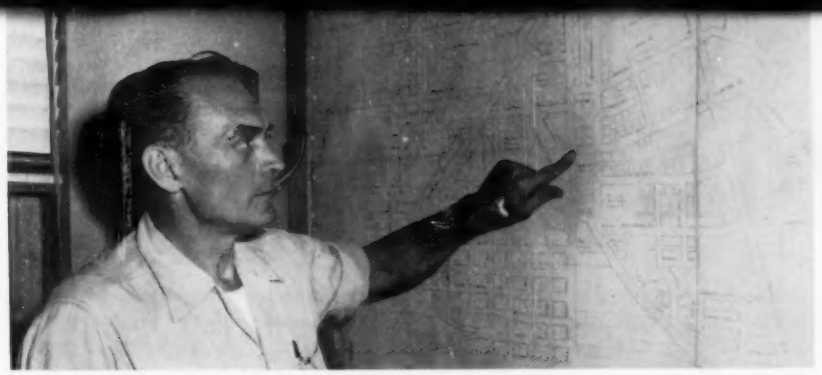
The old bill accommodated 17 lines of print; each charge took up one. There were seldom more than five lines involved: one for the water consumption, one for electricity consumption, one each for electricity consumed by water heaters, for ash removal and garbage removal service. Occasionally, when an electric or water meter broke down and had to be replaced, the charge took up two lines—bringing the total number of lines used on the form to six—because readings for both meters were shown.

The new bill accommodates 11 lines, but each utility charge requires three. Thus, with a few accounts there isn't enough room to itemize all charges. The office therefore sends out a second bill to all electric water heater customers. Removal of this item leaves room on the first bill for the others. Cost of preparing and mailing the additional bills doesn't amount to more than a few dollars a month, Mr. Weidaw states.

Bitumuls "Slurry-Seal" Demonstrated

"Bitumuls Slurry Seal", this newly-developed technique was demonstrated on a Monterey county road near the town of Aromas, California. The seal employed a mixture of fine aggregate, Bitumuls SS-1 emulsified asphalt and water. A transit mix truck was used for the blending of materials and the liquid slurry was fed directly into a sled-type box, equipped with a rubber-edged, squeegee-type strike off, drawn behind the mixer truck.

The slurry seal penetrated and sealed cracks, filled minor depressions, and provided a new, even surface, pleasing in appearance, all in one, quick application. Bitumuls slurry seal does not "bleed", provides an excellent surface on which to apply the conventional chip seal coat if desired.



● **LOCATION of new 18-inch interceptor line to relieve overtaxed laterals of the existing system is pointed out by Aubrey Hayes, Superintendent of Salem Utilities.**

Revenue Bonds Finance SEWERAGE MODERNIZATION

EXTENSIVE improvements and enlargement of sewage facilities at Salem, Ohio, are in the final stages, financed by an issue of sewage revenue bonds that allot about $608,000 for the work. This program stems from an original order from the Ohio Pollution Control Board in 1952, when sewage facilities were declared inadequate and overloaded, and study was begun for the improvements.

Malcolm Pirnie, consulting engineer of New York City, was engaged in 1954 to make a preliminary report and then for drawing plans and specifications. The latter included installation of 4800 feet of 18-inch, extra strength vitrified clay pipe for a new interceptor sewer and for reconstruction of the existing sewage disposal plant.

"This sewage plant was Ohio's first activated sludge sewage treatment plant," said John Wright, resident engineer representing the consulting engineer and the city of Salem on the job. "Its capacity when installed in 1927-28 was approximately 1,000,000 gpd. We're enlarging this to about 2,000,000 gpd, using the old activated sludge tanks, but improving the clarifier and adding a trickling filter, 100 ft. in diameter."

Installation of the clay pipe interceptor line ran into trouble in the first few weeks of installation, as the trenching had to be done in quicksand and water. It was necessary to excavate some lines to a depth of 15 feet or more and the men worked in steel ditch-lining shells or cases, rather than using shoring.

In laying the interceptor, crushed stone fill had to be used in the bottom of the trench to give the line a good base before the clay pipe could be placed. The joints of the 18-inch pipe were sealed with grouted cement in a rubber joint, pumped in at about 60 pounds pressure. Such careful work naturally slowed the interceptor line installation work.

"John H. Murnane, of Cleveland, is handling reconstruction of the sewage plant," reported Aubrey Hayes, superintendent of Salem utilities, under the local utilities commission. "We're glad the program is nearing completion. Financing details of this project are of interest:

"Citizens are paying for the improvements through charges based on water usage, amounting to about 53 percent of the individual water bills. All this goes back a ways—we started the charges in March, 1953 with a 65 percent sewage charge. Then in November, 1953 the voters said this should stop and also voted money refunded to sewage users. This in turn was modified to a charge of 35 percent of the water bill in January, 1954 and it was found necessary to increase the charge to 53 percent in March of that year, adequately and properly to finance the needed sewage improvements. The bonds are callable; they normally run 20 years and carry 2.75 percent interest, but can be called and paid off faster, if desired."

● **LAYING procedure: Excavator in rear; tractor-mounted shovel, not shown, brings in crushed stone for stabilizing trench base; pipe is lowered into trench.**

TELEVISION for

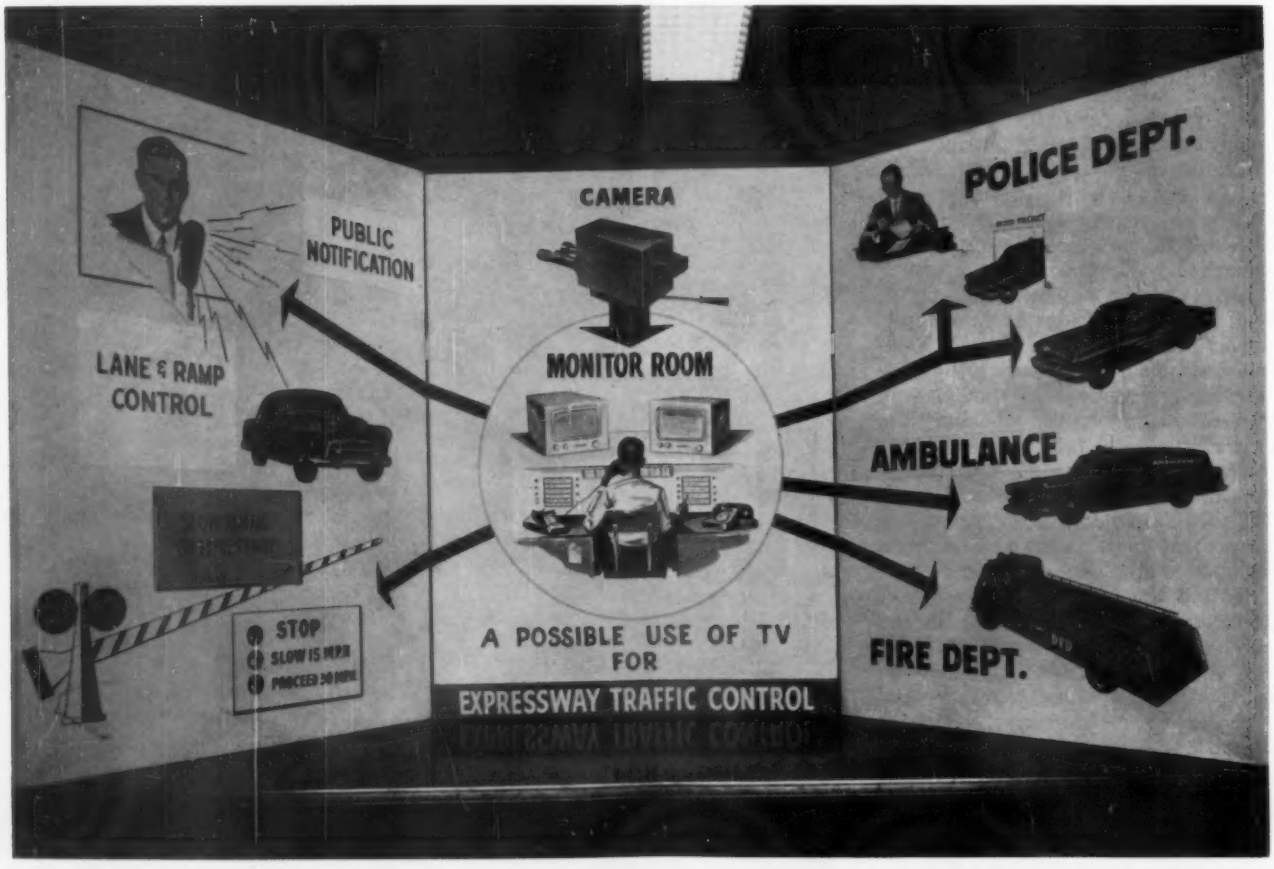
EDWARD JANICKI

DETROIT, one of the most safety-minded cities in the nation, is trying out a new approach to traffic control. The approach: television. The city is using television cameras to help halt jams on several new expressways. Although still in the experimental stage, the work done so far promises wide possibilities for expressway traffic control, enforcement, education and research.

Under the experimental program, TV screens pick up traffic on closed circuit cameras along the route of the expressway. As trouble is spotted, a traffic control plan immediately is put into operation. A monitor, located in a downtown building, can determine whether to send an ambulance, fire truck or expressway control car to the trouble scene. Calls also go to engineers for operation of lane and ramp controls which prevent additional traffic from coming on to the expressway and expedite the flow of congested traffic. Simultaneously the public is notified by radio.

When an accident occurs now, it takes time to get the police and wreckers to the scene. As a result, traffic keeps piling up, making it more difficult for police and wreckers to get there. An excellent example of the havoc that can be created on an expressway occurred earlier this year shortly after the Edsel Ford Expressway opened. Traffic was tied up for two hours when an auto carrier overturned and caught fire on the X-way. Such lengthy tieups are inevitable when an accident occurs during rush traffic because so many cars are already on the expressway. In this particular case, traffic got logjammed for a four-mile stretch. City officials later pointed out that the TV system could have averted this. Police could have stopped all traffic entering the routes by means of lights at entering ramps since they would have been immediately notified of the mishap by the monitor. The current experiment is being conducted jointly by the Department of Streets and Traffic of Detroit and the Michigan Bell Telephone Co.

Studies conducted to determine the most effective means of handling accidents and congestion quickly so that resulting traffic jams might be prevented have emphasized the fact that the key to any effective and successful traffic control plan for such expressways is a good detection device. In Detroit particularly, where new expressway



● **POSSIBLE use of television in an overall traffic control plan has been considered in form shown here, whereby centralized traffic control would be possible at the monitoring point to handle fire and police vehicles and provide other controls.**

TRAFFIC CONTROL

● **OPERATION of Detroit's TV experiment is explained by A. F. Malo, left, in charge of Streets & Traffic, to Mr. Walker, Mayor Cobo and C. W. Phalen of Bell.**

links are opening every few months, it has become increasingly apparent that accidents and build-up of congestion must be observed as soon as these situations occur and the observer must be in a position to take immediate action. Realization of this fact led traffic engineers in Detroit to consider the application of television for this purpose.

Communications experts of the Michigan Bell Telephone Co. familiar with many of the possibilities for television application expressed their willingness to work with the staff of the Department of Streets and Traffic. For several months the two agencies have been working closely conducting special tests. A monitor room was set up at the Veterans Memorial Building in the heart of Detroit's Civic Center in which television sets, special telephones, remote controls and other equipment were installed.

At the same time cameras were set up on selected vehicular and pedestrian bridges on sections of the Ford and John C. Lodge Expressways. Traffic was monitored during peak travel periods both in the morning and afternoon. Special tests were conducted at night during periods of darkness and with different types of street lighting. Other tests were conducted from varying heights ranging from approximately 20 feet to almost 100 feet above the road surface. Remote control equipment in the monitor room enabled observers to traverse and elevate cameras and to make use of a special telescopic type lens at camera locations three to five miles distant from the monitoring point.

All in all, Detroit believes television is an answer to the traffic situation. Traffic engineers believe its best use will be realized when it becomes an integral part of an overall traffic control plan. Currently plans are being discussed for expanding the experiment to the point where such an overall plan might be put into operation and properly evaluated. While the cost of such a program has not yet been estimated, city officials say it probably will run above $2 million.

"The experiment with television up to this point has been so encouraging and favorable that I am convinced we should make a full and complete study for traffic management purposes," declares A. F. Malo, Director of Streets and Traffic. "It seems to me that every motorist who uses the new expressways will agree that we should make every effort to keep them operating, particularly during peak traffic periods." Mr. Malo believes money going into the expressways from Federal, State and County funds "could be used for the TV control plan because the operation of the system is a responsibility of all branches of the government."

The accident rate on the expressway system in 1954 was about one-tenth as great as the rate on the six principal streets within the city. There were 230 accidents for each 100 million vehicular miles travelled on the expressways against 2,000 accidents for the same mileage on the city's major thoroughfares, including Grand River, Jefferson, Fort, Michigan, Gratiot and Woodward. There have been no fatalities on the expressways proper this year. Mr. Malo said that while the figures for 1955 are not up to date, he feels certain the accident rate this year on the expressways will be considerably lower than last year.

● **CAMERA located on top of a pedestrian bridge over the John Lodge Expressway, in Detroit, is being adjusted. Note waterproof housing for the television camera.**

● **INITIAL** repair step was removal of all loose rock and debris from the wall, leaving only sound sections in place.

● **REINFORCING** skeleton was placed and new drainage tile installed to prevent damage to the structure after repair.

RETAINING WALL REPAIRED *by Gunned Concrete*

A MENACE to pedestrians and motorists . . . that was the situation with this badly deteriorated retaining wall in Grafton, West Virginia. After a rain, or often with no provocation, rocks and dirt would come hurtling down the embankment onto the sidewalk and street. Consideration was given to closing the street to pedestrian traffic. The problem was to repair this menace, yet cost was a definite factor to be considered.

The first step was to remove the broken and loose sections of the old wall. It was then decided that the only practical and economical way to repair the structure was to employ the technique of air placed or gunned concrete, eliminating the necessity of building forms and pouring an entirely new wall. First job was to prepare the salvable part of the old wall. A skeleton structure was then laid down to add strength to the new wall. Had the poured concrete method been used, the time taken to reinforce the wall would have been required to construct the pouring forms. Drainage tile was put in place so that future rains could run off and seepage would not damage the new concrete or the finished wall. Much of the old concrete was used to form a solid base for the concrete which was to be gunned over the framework. Concrete gunning equipment was set up in the street, using a Model #750 Bondactor, made by the Air Placement Equipment Co. of Kansas City, Mo. The new concrete was gunned over the steel without the aid of any forms. Because gunned concrete is so dense, and sets up so rapidly, it was an easy job to form the correct wall angle. Very little troweling was necessary to achieve a good looking job. The finishing touches were then put on, and the sidewalk was gunned with a new coat of concrete. Grafton city officials were pleased with the speed, efficiency and quality of work produced by using air placed concrete and the end result was a safe, new retaining wall at a very reasonable cost. Pictures herewith show the original condition and the finished job.

● **NEW CONCRETE** was gunned over the steel with a Model 750 Bondactor. Little troweling was needed on finished wall.

● **FINISHING** touches included a new coat of gunned concrete on the sidewalk. Note textured, even surface of wall.

● LOS ANGELES' renowned Plaza in the old section of town is cleaned at night to avoid heavy concentrations of traffic.

● VERSATILITY of the sweeper is shown as equipment maneuvers around parked car on a Los Angeles residential street.

How Los Angeles Operates its STREET SWEEPER FLEET

RICHARD MULCAHY

DESPITE a halo which is somewhat smog tarnished, Los Angeles, city of the angels, is managing at least to keep its feet clean through the 7-day-a-week, 24-hour-a-day efforts of a fleet of 38 motorized street sweepers which clean 26,226 curb-miles of streets every month. The city-wide average sweeping cost for Los Angeles' fleet of street sweepers is $6.70 per operating hour, which includes wages and depreciation cost of the equipment. Since sweepers average 30 curb-miles per 8-hour day, the apparent curb-mile operating cost is $1.78 per mile. Though much lower than hand methods, this cost appears high. A recent survey by the Wayne Manufacturing Company, which manufactured most of Los Angeles' sweepers, of a number of cities using Wayne sweepers showed that the national average is $1.00 or less per curb-mile. Variance in operating costs usually results from differences in wage scales and in depreciation periods. Los Angeles, however, feels that its higher than average cost is attributed to two factors.

These are: 1) the abnormally large numbers of cars that park day and night on residential streets, forcing the sweeper to return again and again properly to clean the street, which slows down the operation and raises the cost per curb-mile; and 2) the unusually long distances which the sweepers have to travel before they can begin to work.

Los Angeles has been considering the installation of "broom-o-meters" on its sweepers to show more accurately the cost of sweeping a curb-mile. At present, the sweeper's speedometer is used and the city feels this method of accounting costs does not give an accurate figure. It does not show, for example, how many times the sweeper has to maneuver, with its broom inoperative, to reach a particularly stubborn section of street.

The First Motor Sweeper

Ben R. Paris, Director of the Bureau of Street Maintenance, who recalls that Los Angeles bought its first motorized sweeper in 1930, has organized his 380-man clean-up department on the basis of "occurrence" to cope with the mounting accumulation of trash on the city's streets. Most dirt and trash occur in the downtown business area and on major streets and highways, he explains, so Los Angeles sweeps over 300 curb-miles in these sections every day to provide clean streets for business people and for shoppers.

Streets in the downtown area are cleaned daily, outlying business districts and heavy traffic boulevards are cleaned 8 times a month and residential areas are swept once every two weeks. A few critical locations in the heart of the downtown area are swept twice a day.

Areas where heavy traffic is encountered are swept by the "block" system in which the sweeper goes around one complete block at a time to offer less resistance to the flow of cars. The "street" system is used in residential areas. Under this system, the sweeper continues along one side of a street to a pre-determined boundary and then turns to sweep the other side. One-way streets require the use of a double-gutter broom sweeper which permits the operator always to work in the direction the traffic is moving.

Los Angeles believes the "street" system is more efficient than the "block" system because the sweeper can make better time with fewer corners to turn.

Most of Los Angeles' 38 sweepers are self-contained and can hold 3 cubic yards of rubbish in the hopper. The advantage of central dumping, which is employed so efficiently and economically in many cities, cannot be used in Los Angeles because of the distances to the dump sites.

Distances encountered (48 miles north to south, 24 miles east to west) have forced Mr. Paris to establish the "unit" system in which a sweeper collects and dumps on the

street for a truck with a lift-loader to pick up. "We are not satisfied with this method", he says. "Trash left too long becomes scattered, especially on windy days. Open lift loaders on the trucks also permit dust and light trash to be blown about."

Versatility is a prime requisite for a street sweeper to succeed in Los Angeles. Residential builders of two and four-unit apartment houses during the thirties did not anticipate the city's 1½-car per family average and did not provide adequate garage capacity. Motorized sweepers, therefore, must be designed and engineered to hug the curb for efficient sweeping and be able to turn sharply to avoid cars that are parked 24 hours a day.

Los Angeles' heavy traffic which contributes to the litter accumulation, also provides the sweeper brigade with another problem after a busy weekend of minor car collisions. Sweepers must be capable of sweeping up glass and bits of metal without jamming the pick-up mechanism.

Another problem the motorized sweepers face in Los Angeles is the cleaning of a network of alleys which bisect almost every block in the downtown area. For the most part these alleys are narrow, often congested, with trucks loading and unloading, and are heavily laden with refuse from stores and restaurants. In addition, most of them are constructed with center "V" gutters which makes it difficult for the brooms of the sweepers to clean them and at the same time maneuver between parked trucks. Therefore, the majority of Los Angeles' alleys are swept by hand until the Bureau of Street Maintenance can find a suitable small power sweeper which can do the job adequately. The Bureau is also looking for a medium powered sweeper to sweep sidewalks in the downtown area.

A comparison of the costs of mechanical versus hand sweeping is provided by the corps of push broom men the city still maintains. Hand sweeping costs $5.06 a curb-mile, nearly 3 times the cost of power sweeping. Los Angeles estimates sweeper life at about 10 years, although with correct care and maintenance an almost indefinite life expectancy can be attained.

Mr. Paris expresses his enthusiasm for motorized sweeping in plain terms when he says: "In Los Angeles we have a chronic trash offender we call the 'litter-bug'. While we're trying to educate him not to throw rubbish into the streets, our power sweepers have plugged the dike, keeping us from becoming engulfed in a sea of trash."

● **STREET CLEANING** action of this sweeper picks up refuse and scrubs the pavement. Controlled water spray settles the dust and helps pickup of light particles.

Tree Planting and Care in Chicago

More than 17,000 new trees were planted in Chicago, Ill., in 1954, and 300 acres of unused land on O'Hare Field are being used to initiate a program to provide 20,000 trees a year, starting in 1960. Other forestry activities included trimming 34,000 trees, spraying 30,000 and removal or trimming of 26,800. From 12,618 dead trees processed for sale, 541 carloads of wood chips were produced which were sold for more than $23,000.

• • •

Faulty Check Valves Contaminate Water Systems

"An investigation was made of a complaint about the potable water supply aboard a naval vessel which was using the shipyard water during its period of overhaul. The complaint was that the water had a bitter taste and a bubbly appearance and that it turned bluish-green in contact with soap. A large portion of the ship was affected. Samples of water taken for bacteriological analysis were negative. By chemical analysis, the water samples were found to contain up to 403 ppm of carbon dioxide; pH was 5.1, with 88 ppm total solids and 64 ppm copper. A dockside sample of water taken at this time contained 1 ppm carbon dioxide, with pH 7.2, 10 ppm total solids and 0.2 ppm copper.

Since the ship's soda fountains were not connected, the only source of carbon dioxide on the ship was a group of several carbonated beverage dispensing machines temporarily connected to the water system on the hangar deck while the ship was in port. When these dispensing machines were disconnected and the water system flushed out, the water supply quickly returned to normal. Apparently, the check valve on one or more of these machines had broken down, permitting gas from the carbon dioxide cylinders to pass through the system, carbonating and acidifying the water. The copper and brass fittings of the water system are readily attacked by solutions having a pH of about 5 or less, hence the accumulation of copper in these samples. The blue-green discoloration in the presence of soap is produced by reaction of the dissolved copper with alkali metals and/or amino compounds generally contained in soaps or detergents as currently manufactured." *USN Medical News Letter.*

WEED CONTROL

HAL G. SMITH

District Maintenance Superintendent, Washington State Highway Department

(In the "Washington Highway Department News")

● **SPRAYING is done at a road speed of 6 to 8 miles an hour with 4 to 4½ gpm.**

● **TANK has 700 gals. capacity and is mounted on any small maintenance truck.**

IN 1954 a spray control program was initiated in the Yakima Maintenance Division, with the aid and advice of the Yakima County Extension Service and State Department of Agriculture. This involved the spraying of 227½ miles of highway right-of-way. In the previous year weed and brush control in this division had consisted of the use of highway type mowers supplemented by hand cutting of brush with loppers and axes. Three mowers were used during the summer months, at a seasonal rental cost of $1,200 each. In the lower irrigated regions of the county, the shoulders had to be mowed 4 or 5 times a year, and in other areas, 2 or 3 times. Following the spraying, it was found that one less mower was needed, and the frequency of slope and shoulder mowing cut in half.

It is difficult to determine the cost of brush cutting, as the work is done by hand, and is sandwiched in between other jobs. But a high percentage of brush-kill was observed that fall and again this past spring, showing that root systems were badly damaged or destroyed. In certain areas of semi-swampy roadside, on which wild rose and willows were prevalent, an almost complete kill was accomplished. Previously, a crew of 4 men spent 1 to 2 weeks each season with hand loppers clearing this section. The past spring not a single day was so spent.

Following are the methods and materials used during the spray program of 1954: The equipment used in the spray program consisted of a 700-gallon shop-made tank and a 15,000-gal. per hour, low pressure 3-in. self-priming centrifugal pump. The tank is mountable on any of our small maintenance dump trucks, and, in conjunction with the pump, had been previously used for watering roadways and stockpiles, flushing culverts, washing bridges, etc. Suitable fittings, gauges, by-passes, screens, valves and connections had to be constructed to utilize this equipment for a spray rig. It was a little difficult, in that the 3-in. pump connections had to be reduced to a usable ¾ in. The great capacity of solution, (15,000 gal. per hour), that could not be used for spray purposes, was by-passed back into the tank and used for agitation. By controlling the quantity of this by-pass, a constant pressure of 30 lbs. could be maintained.

Using Chemicals

The chemicals used were 2,4-D and 2,4,5-T in lot volatile esters. For noxious weed and broadleaves, 2,4-D was used at the rate of 2 gals. per 100 gals. of water. For brush, etc., in the mountainous areas, the mixture used was 1 gal. of 2,4-D and 1 gal. of 2,4,5-T per 100 gals. of water. This included willows and evergreens. Diesel oil was added as a carrier at the rate of 3 gals. per 100 gals. of water.

The spray program was more or less divided into two sections or parts; the earlier spraying of noxious and broadleaved weeds in the lower valley, followed up by roadside and spot spraying for brush, willows, evergreen, etc., in the mountainous areas. Growth more than 4 feet high was first cut and then given the stump-kill treatment.

Most of the spraying was done at a road-speed of about 6-8 miles per hour, 30 lbs. pressure, and 4 to 4½ gals. per minute at nozzle. The speed varied according to the roadside right of way width, (which varied generally from 8 ft. to 15 ft.), and the density of weeds and/or brush. Thirty-three work days (or parts thereof), were spent applying the spray. Some work days were rather short and somewhat scattered due to wind and weather conditions, minor pump break-downs, and other work programs. One 1½-ton dump truck, the tank, pump, and two men were used each day.

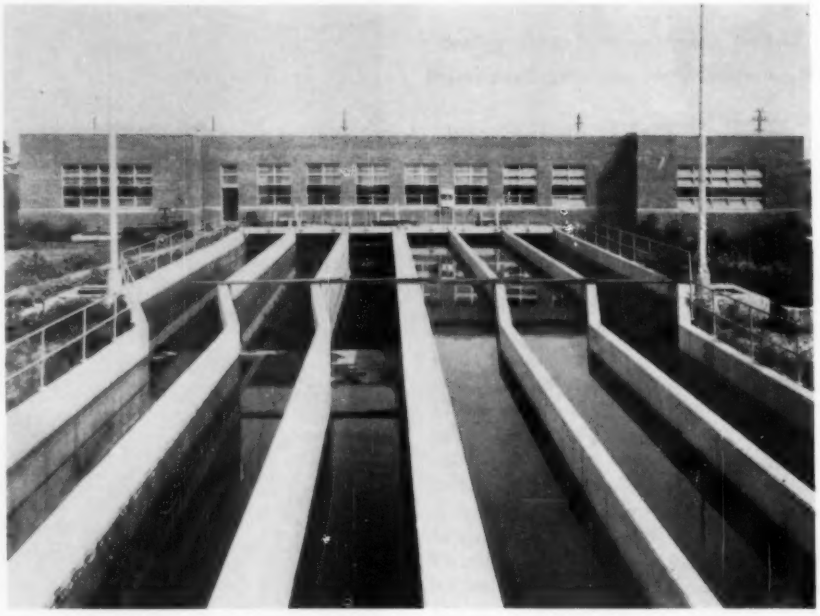
PHILADELPHIA'S MODERN SOUTHWEST

SINCE 1946 Philadelphia has spent $65 million in its $80 million program to build the sewage treatment facilities necessary to handle all of the city's waste, and to provide reserve capacity for an anticipated population and industrial growth in the future. With the new Southwest Works in operation, this farsighted program is near to completion. When the last unit in this program, the Southeast Works, is finished in 1956, streams and rivers in the Philadelphia area will be freed from sewage pollution.

The city of Philadelphia is divided into three drainage districts, which are interlaced by a vast system of intercepting sewers. The Northeast district, largest of the three, contains light industrial and residential neighborhoods. This district is served by the Northeast Works, which started operations in 1951. The Southeast district includes downtown Philadelphia and is the smallest of the three; the new Southeast Works, now under construction, will serve this area. The third district, the Southwest, covers 56 square miles and includes the watersheds of the Schuylkill River, Cobbs Creek and Wissahickon Creek. Much of Philadelphia's heavy industry is located here, as well as the new 3,000-acre Eastwick Redevelopment Site, largest of its kind approved for redevelopment in the United States, which will house 45,000 people. The new Southwest Works, which serves this district, is the subject of this article. It was started in 1949 and finished in late 1954 at a cost of $8 million.

City planners estimate that the Southwest district will have a population of 1,200,000 by 1970. (The present population is 870,000.) Consequently, the Southwest Works has been designed for an average daily flow of 136 million gallons of sewage. Also, the plant is located on a 1,028-acre tract, allowing ample room for expansion, if necessary in the future.

Most of West Philadelphia's sewage drains to the Southwest Works through gravity sewers. Part of it must be raised by pumps at the plant; also, sewage from interceptors on the east side of the Schuylkill River passes through an inverted siphon 75 ft. below the river to a pumping station where it is lifted into the main West Philadelphia gravity intercepting sewer for delivery to the plant.



● **INCOMING sewage passes through grit and screen building in background and into these six grit channels before flowing to flocculation and settling tanks.**

Treatment at the Southwest Works includes screening, grit removal, flocculation, sedimentation and sludge digestion, including extra digester capacity for sludge which, beginning next year, will be pumped from the Southeast Plant. Details of these units follow:

Bar Screens—Incoming sewage at Southwest flows directly through six Link-Belt inclined bar screens; each is 5½ ft. wide, 9 ft. deep, and has bars set with 1-in. clear openings. The floating materials arrested by these screens, such as sticks, rags, boxes, etc., are mechanically removed by rakes. Each of the eight rakes on each screen consists of bar teeth mounted on a flight which is attached to two endless strands of 730 pintle chain with K-10 Promal attachments on each link. As the rake travels from the bottom to the top of the screen, the teeth mesh with the bars and the screens are cleaned. Each rake travels at 10 fpm, the drive consisting of a 1-hp TM-50 gearmotor and an RC-80 roller chain in an oil-tight casing. All six of the screens discharge the collected debris onto one 16-in. wide steel belt conveyor operating on 80-ft. centers. This conveyor, which is made of special ductile steel, travels on wood skids. Link-Belt flat roll idlers with babbitted bearings are used to support the belt on the return run. The conveyor has the conventional pulley drive, but spring takeups are used to help compensate for tension variations due to temperature changes. A steel belt was used here, as the wet screenings would tend to deteriorate rubber belts.

The conveyor has a speed of 10 fpm and the drive consists of a 1-hp gearmotor and roller chain in an oil-tight casing. The conveyor discharges into pneumatic ejectors which, in turn, discharge the screenings into a lagoon.

Grit Channels — Sewage flows through the bar screens, which are located in the grit and screen build-

SEWAGE TREATMENT WORKS

ing, into six grit channels, each 60 ft. long, 9 ft. wide, and 10½ ft. deep. The channels have a larger cross section than the influent sewer, so velocity of sewage flow is reduced to about one foot per second, allowing such solids as sand, coal dust, pebbles, etc. to settle out. Link-Belt grit collectors are used in the channels in a countercurrent operation to scrape the settled matter back into collecting devices, which are located in the grit and screen building. Each collector is 55½ ft. on centers and operates at 8 fpm; each consists of two strands of Link-Belt C-111 combination chain with attachments and channel flights (with welded steel scraper flats with Ni-hard wearing shoes) at about 5-ft. intervals. There are three drives, each handling two conveyors. These drives consist of a 3-hp gearmotor through chain to the head sprocket. At the influent end of each channel, an inclined Link-Belt screw conveyor, 24 ft. long and 20 in. in diameter, in a trough, is set to receive the grit and elevate it to a steel belt conveyor inside the grit and screen building.

All six screw conveyors discharge onto this steel belt conveyor, which is exactly like the one serving the bar screens. It discharges to pneumatic ejectors which blow the grit to lagoons.

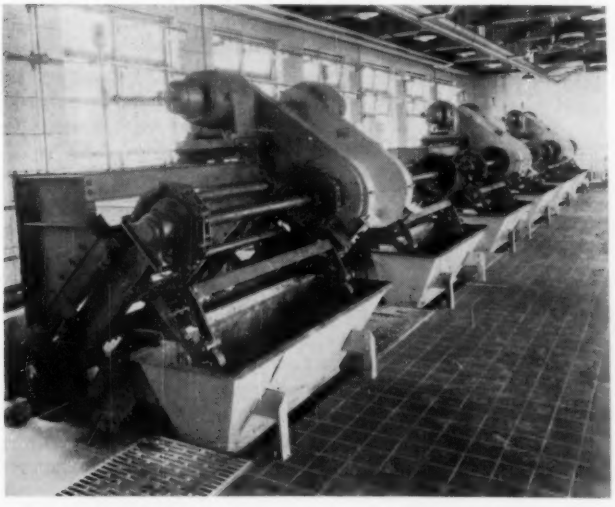
Flocculation Channels—The sewage flows into two flocculation channels—each 500 ft. long, 30 ft. wide and 16 ft. deep. Air is applied to the sewage to float grease and to coagulate the suspended solids. Before going into the primary settling tanks, the sewage flows through two aerated influent channels, each 250 ft. long, 9 ft. wide and 11 ft deep. More air is applied to continue the aeration process started in the flocculation channels and to prevent deposition of solids. This air is supplied by two positive displacement blowers, each having a capacity of 1,500 cfm of air.

Primary Settling Tanks—Over 89,000 cu. yds. of earth were removed to prepare a site for the primary settling tanks and flocculation channels. Some 1,200 tons of reinforcing steel and 16,000 cu. yds. of concrete were used in the construction. Each of the four settling tanks is 250 ft. long, 125 ft. wide and 13½ ft. deep, giving a total surface area of 125,000 sq. ft. As the sewage flows through the primary settling tanks, approximately 50 percent of the suspended solids settle out. Tanks are designed to provide a two-hour sedimentation period.

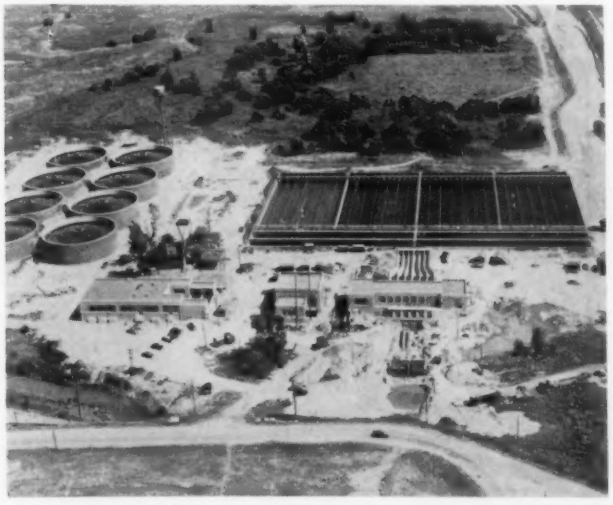
There are seven longitudinal Link-Belt sludge collectors in each of the four primary tanks. Each collector is 250 ft. long and consists of No. 730 Promal pintle chain with redwood flights spaced at 10 ft. intervals. The collectors operate at 2 fpm. Two cross collectors are located at the influent end of each tank to receive the sludge from the longitudinal collectors towards the effluent end of the tanks; these move surface scum toward a scum baffle located at the effluent end where a Link-Belt scum skimmer is located in each tank to convey the scum to discharge buckets.

There is a total of 28 longitudinal collectors, 8 cross collectors and four scum skimmers in the primary settling tanks. Link-Belt QM-85 motorized helical gear reducers are used on the longitudinal and cross collector drives. The sludge and scum collected by this equipment are pumped to the digestion tanks. The effluent is discharged into the Delaware River.

Sludge Digestion — Each of the eight sludge digestion tanks at Southwest are 36½ ft. deep and 100 ft. in diameter. As sludge is pumped from the primary settling tanks, it is heated to about 100 degrees F. The digested sludge is pumped to a nearby lagoon.



● **LARGE DEBRIS is removed by six inclined bar screens, each 5½ ft. wide, 9 ft. deep, with 1 in. clear between bars.**



● **AIR view of the new Southwest treatment plant, showing settling tanks, right center, digesters and main buildings.**

ELM TREE DISEASES, *Insects and their Control*

ALBERT DI DARIO

Entomologist and Plant Representative, The Oliver Corporation

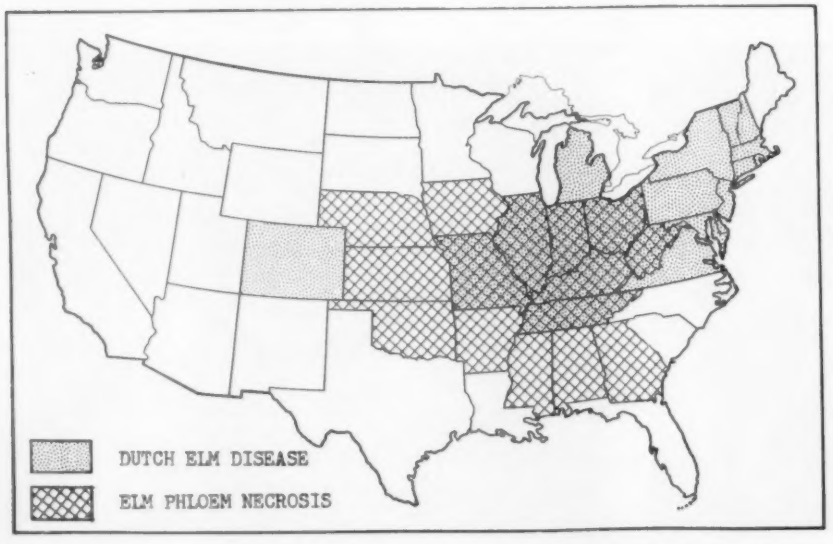
DUTCH ELM disease, elm phloem necrosis and the elm leaf and bark beetles are the most destructive disease and pests of elm trees in the United States. Wherever elm trees exist in this country, these diseases and insects will constitute a problem. The Dutch elm disease infests all varieties of elms commonly grown in the United States and some related species. The American elm is the most susceptible, with European and other native elms moderately to highly susceptible. The Chinese and Siberian elms are resistant to this disease.

The Dutch elm disease is not of Dutch origin. The misleading name was given to the disease solely because it was first investigated in Holland during 1919. It was noticed earlier in Europe and apparently was brought there from a yet undetermined place. It was found in Ohio in 1930 and in New Jersey during 1933. Until 1945, it was confined to an area less than 100 miles from New York City and in Ohio.

Dr. Richard J. Campana, Plant Pathologist at the University of Illinois, reports that within five years the disease had spread from the New York city area over 7,500 square miles and had destroyed more than 27,000 trees in New York, New Jersey, and Connecticut.

Presently, Dutch elm disease occurs in the Eastern and Central States, and as far west as Colorado. The rapid spread is indicated by the records. In 1953, only fifteen counties were known to be infected in Illinois. During 1954, it was found that fifty-five counties had infested trees. This represents a spread of approximately 125 miles north and south of the known infested areas of 1953.

● **ELM bark beetle can be seen feeding on elm crotch. This is the method of disease transmission. Photo from USDA.**



● **MAP shows areas of the United States that are affected by Dutch elm disease and by Elm Phloem Necrosis. Note key to location of both diseases in lower corner.**

Life History

Dutch elm disease is a fungus with one-celled spores. This fungus is transported from diseased to healthy trees chiefly by two insects, the smaller European elm bark beetle and the native elm bark beetle. The disease is also spread by natural root grafting.

The elm bark beetles breed or feed in all species of the elm trees. Eggs are laid in galleries bored by the females, and these galleries are enlarged by the larvae. Upon emerging, the young larvae feed upon the inner bark, leaving galleries which are more or less perpendicular to the vertical gallery bored by the female. After feeding, the larvae pupate and appear as adult beetles. These adult beetles may be covered with fungus spores externally, or may be infested internally with them. The beetles feed upon living parts of the tree they emerge from, or upon parts of trees they fly to.

Many breeding places are difficult to detect but the typical feeding scars made by the beetles can be found easily where young twig crotches occur. The fungus enters those tree cells which act as conductors of water and into adjacent cells where it prospers and reproduces. Symptoms can be observed from the latter part of May until late Fall after the fungus has become established. The disease is

characterized by slow or rapid wilting, yellowing, dying, and dropping of the leaves. The young foliage is affected first, and later all leaves take on these characteristics. The whole tree or any part of it may be infected.

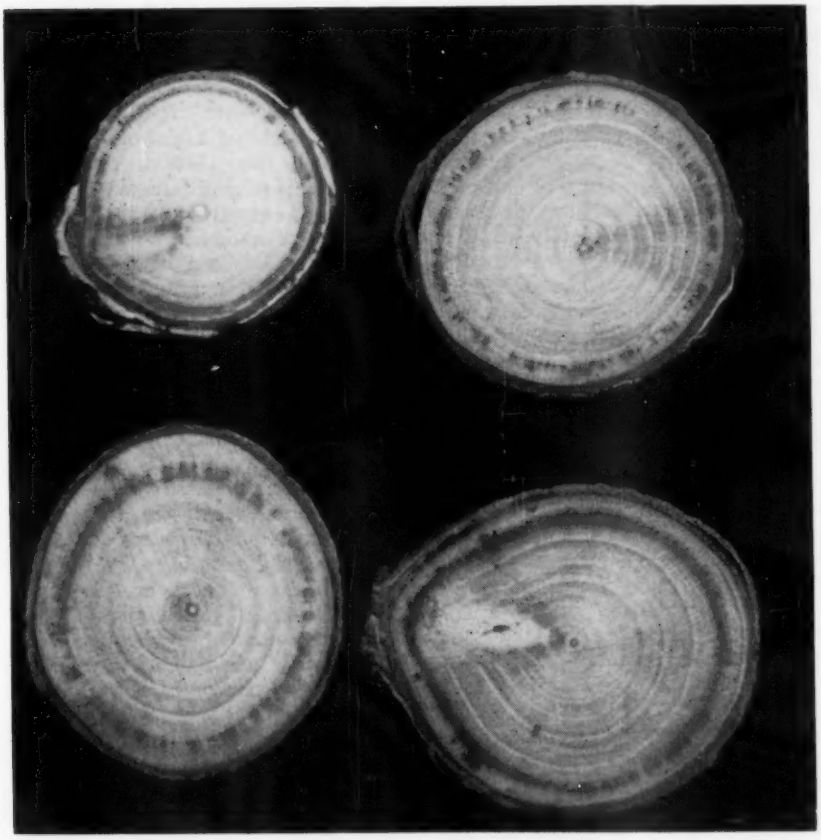
Control Measures

Direct control of the disease has not yet been accomplished. However, researchers are now working with chemotherapeutants and hope to be able to eradicate the disease. Some encouraging results have been obtained.

One method of control is the removal and destruction of diseased trees as soon as they are found. This procedure helps to keep the disease in check by retarding spread until other means of control are found. It is not an ideal situation for, besides the expense involved in tree removal, trees have been lost and denuded areas exist where once beautiful trees thrived. Later, replanting will become necessary, adding to the expense of maintaining city parks, street trees, and forest preserves.

The relation between elm bark beetles and the spread of the disease suggests the key to the control methods recommended—sanitation and spraying. Sanitation involves the removal and destruction of all dead tree parts and the potential breeding places of both the insects and disease. Woodpiles, logs, and fallen trucks, as well as dying tree limbs may be a source of trouble.

Where sanitation alone was practised during 1944-46 at Princeton, N. J., the average reduction in losses of sanitated trees over non-sanitated trees was 34 percent. During 1948-1950 a spraying program was followed at Princeton resulting in an average reduction in losses of sprayed elms over unsprayed elms of 90 percent.



● **CROSS-SECTION of elm branches affected with the Dutch elm disease. The concentric rings appear as a brown discoloration about a half inch from outside of tree.**

Any spraying program depends upon the knowledge of the life history of the insect or disease against which control measures are taken. The success of any spraying program relies upon the extent of this knowledge, the chemicals used for control, the type of equipment, exact timing of spray applications, and upon the skill of the operator.

Hydraulic Spraying

For many years hydraulic spraying of trees has been practised with excellent results. For tree work, there are two basic types of hydraulic sprayers: the engine driven sprayer and the power take-off sprayer. Hydraulic sprayers usually apply 15-40 gallons of coarsely atomized dilute spray per tree, depending on size and shape. This requires heavy high pressure equipment, and a large accessible water supply. Excellent coverage of foliage and branches with spray material is provided with hydraulic sprayers. The particle size of the liquid emanating from a hydraulic sprayer is large. Consequently, a dilute spray mixture is utilized to spray trees with this equipment so that injury to foliages does not occur. The areas sprayed must be thoroughly wet to obtain good coverage. The heavy wetting results in one-third to one-half of the spray material being wasted in run-off; and this type of spraying is time and labor-consuming. The drip associated with hydraulic spraying becomes a problem where the material runs off onto sidewalks, driveways, and parked cars.

The engine driven hydraulic sprayer features a tank, pump and engine, making a compact unit on wheels or a skid. Engines for this type of sprayer are either water or air-cooled. Solution agitation is hydraulic or mechanical. Sprayers for tree spraying vary from 10 to 50 horsepower with pumps having capacity to deliver 20 to 100 gallons of spray material per minute. Tanks hold 400 to 600 gallons of spray material. Pressure of 400 to 1,000 psi are common in the operation of such sprayers.

The power take-off sprayer is another type of the hydraulic sprayer. These units are either mobile or skid type. Mobile type units can be powered by the power take-off shaft of a tractor. The skid mounted units are usually powered by a truck engine.

Power take-off sprayers are low in initial cost, since an additional engine is not needed to drive the pump. Size and design are similar to the engine driven sprayers with pumps having a capacity up to 60 gallons per minute.

Mist Spraying

The most effective and economical method of controlling tree pests and diseases is by mist spraying. The principle of mist spraying for tree work is based upon the injection of spray material into a large volume of air which atomizes the particles of spray material into a fine mist.

Courtesy Ill. St. Nat. Hist. Surv.

● LATE stage of Dutch elm disease, showing marked defoliation, is illustrated in this picture from Illinois.

The higher the air velocity the smaller the size of the spray particle. Because of the small size of the particles (30 to 150 microns) a concentrated spray mixture is used without any injurious effects upon foliage. Particle size is also determined by pressure and the type of nozzle used. An increase in pressure tends further to decrease the particle size.

Mist sprayers or blowers apply mist at the rate of one to three gallons per large size shade tree. The fine mist, often invisible, penetrates the air surrounding the foliage and an even deposit of chemical is left on all leaf surfaces.

Air velocity is not of prime importance in mist spraying except for the function stated. The important feature of a mist sprayer is the capacity of air it can deliver per minute. Atmospheric air surrounding a tree must be displaced by air in which is suspended a finely atomized spray. Therefore, air volume is the prime factor. Too little air volume will result in an inadequate deposit of spray material and too large a volume of air may force the material through the tree into the atmosphere.

Pressures from 50 to 600 psi are used in mist spraying, the higher pressures functioning only to help in atomizing the spray material. Mist sprayers are provided with either hydraulic or mechanical agitation and with piston or low pressure type pumps. Some models of mist sprayers for tree work have fixed air nozzles while others have air nozzles mounted on turrets which revolve 360 degrees. Mist sprayers are available as skid models for mounting on the bed of a truck and as wheel models which can be pulled either by tractor or truck.

Since many kinds of spraying machines are available, it is important when selecting this equipment to keep a number of things in mind. It must be ascertained that the unit selected will do an adequate job and that it be designed with simplicity. Adjustments and replacements must be made easily. Quality of material and construction are important considerations.

John R. Balin, Assistant Superintendent of Parks, Greenwich, Conn., states, "With our control program, we can show anyone that we have been able to classify this disease in the category of most of our common maintenance diseases. We may never completely wipe it out, but so long as it stays in one percent of our total population of elms, we should not have to worry too much about Dutch elm disease." Greenwich still has over 6,000 of its original elms in spite of being the first town in Connecticut in which the disease appeared.

In 1946, Greenwich started spraying. The program consists of a dormant spray as early as weather permits, usually around the third week in March, using two mist sprayers. After trying many kinds of spray materials, formulas, nozzle apertures, etc., it was determined that a dormant emulsion of 12 percent DDT applied at the rate of ¾ to 1 gallon per average tree, 18 to 24 inches in diameter, produced the best results. With two mist sprayers, 6,000 elms are sprayed in three weeks. The second spray is put on starting June 15, according to Mr. Balin. This is a 6 percent DDT emulsion. To the DDT is added 2 quarts of a miticide to every 50 gallons of water to prevent a mite build-up that may occur from using DDT.

One of the most important factors in this spraying is proper timing of spray application in order to control the pests, and planning so that little interference is met by winds and traffic. Consequently, mist spraying in Greenwich is conducted between the hours of 7:00 pm and 7:00 am.

The cost of protecting the 6,000 elms in Greenwich is broken down as follows: Removals, $2,673.23; scouting, $188.12; feeding, $1,090.60; dormant spray material, $3,646.99; and labor, $3,084.91. The total is $10,683.85, which represents a total cost of $1.76 per tree.

Following is a record of outbreaks of Dutch elm disease since the program was begun in 1946, when there were 186 diseased elms; in 1947 there were 114; in 1948, 51; in 1949, 46; in 1950, 53; in 1951, 30; in 1952, 48; in 1953, 24; and in 1954, 34. The total reduction in diseased elms has averaged 90 percent or better.

The U. S. Department of Agriculture has stated that probably the most effective method to prevent the spread of Dutch Elm disease is to prevent the beetles from feeding in healthy elm trees by the timely and correct use of a DDT spray.

For this DDT spray, the USDA recommends dissolving 16 lbs. of technical DDT in 4 gallons of Xylene, and adding 1 pint of Triton X-100. This formulation will make 5½ gallons of concentrated material. In spray programs where large amounts of insecticides are required, 100-gallon lots can be prepared by dissolving 294 pounds of technical DDT in 74 gallons of Xylene to which is added 19 pints of Triton X-100. The concentrate must be diluted with water to prepare the spray. The degree of dilution will depend on whether it is to be applied with hydraulic equipment or with a mist blower.

For application as a dormant spray, use the following quantities of the concentrate to make 100 gallons; hydraulic sprayer, 5½ gals.; mist blower, 32 gallons plus 12 gals. of white oil. For application as a foliar spray use half as much concentrate or concentrate and oil as for the dormant spray.

Several insecticide manufacturers market a prepared elm spray, requiring only dilution in water. Standard Oil Company of Indiana markets Standard Elm Spray which contains DDT and Acme white oil. The latter serves as a miticide. The Chemical Insecticide Corp. of Brooklyn, N. Y., markets Mist Blo 26 C containing DDT, white oil, rotenone, and Chemite. Both of these products are toxic also to mosquitoes, elm leaf beetle, leafhoppers, and other sucking and chewing insects.

Elm Phloem Necrosis

Elm phloem necrosis is a virus and is transmitted to healthy elms by an elm leafhopper. Healthy trees cannot be inoculated with the virus which establishes that transmission of the disease cannot be performed

(*Continued on page* 135)

GETTING READY FOR WINTER

● **KEEPING ditches clean is one of the essentials of winter maintenance. Here is one of the three Gradall machines owned and used by Genessee County forces.**

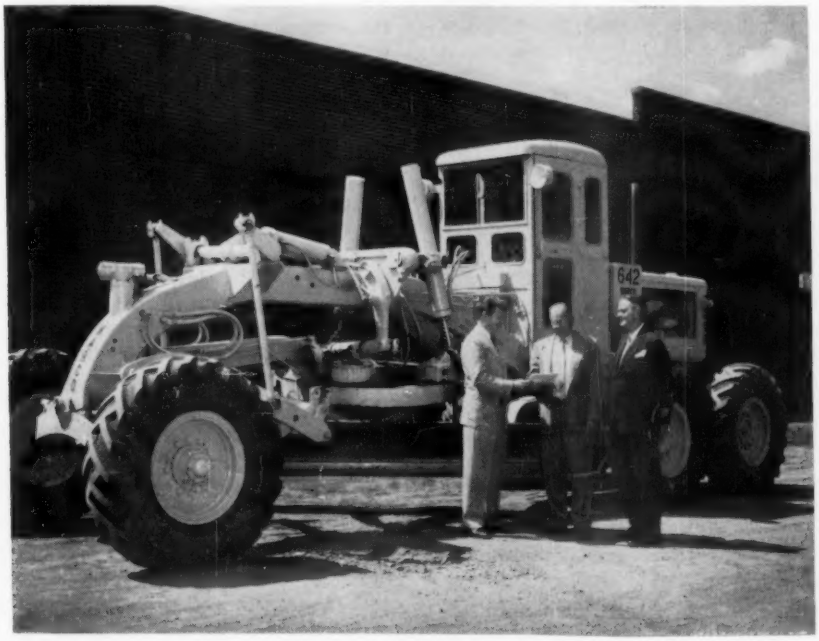
JAMES T. SHARPENSTEEN,
County Highway Engineer,
Genesee County, Michigan

THIS article refers to preparations for winter maintenance of the county road system in Genesee County, Michigan. Our county, situated in the southeastern part of the Lower Peninsula, has an area of 648 square miles. Flint is the county seat. The county road system consists of 1358 miles, divided into 412 miles of County Primary Roads and 946 miles of County Local Roads. In 1954, drivers on these roads traveled 331 million miles, an increase of 25 percent over 1953. Motor vehicle registration for 1954 amounted to 148,000 vehicles, double what it was eight years ago. Residents of Genesee County spent, during 1954, $401 per capita for automobiles which compares with $263 per person throughout the United States as a whole. According to a recent report of the Michigan Employment Security Commission, employment totals for the county reached 141,600 in May with 89,500 being engaged in manufacturing.

Perhaps the reader is wondering what all the statistics have to do with preparations for winter maintenance of county roads. It is an attempt to convey some idea of the type and volume of highway traffic and the consequent highway service required. While nearly all the factories are located in Flint, or in nearby suburban areas, the employees come from far and wide and practically all depend on the automobile for transportation. It is not unusual to find workers commuting 50 miles or more by automobile every day.

To accommodate county highway traffic and provide satisfactory highway service in the winter requires two kinds of planning. The first is long range planning and the second is planning for current needs.

The headquarters of the Genesee County Road Commission are in Flint. Facilities for the repair and storage of equipment are located on the same land as the office building. It would be difficult to find a more central location and, on this account, all operations were conducted from this one central location until recently. Constantly increasing traffic caused a heavy loss of time of Road Commission employees in going to and coming from work, amounting to two hours a day in most cases. To eliminate as far as possible this loss of time, it was decided to decentralize and locate most of the working force and equipment outside of Flint. Accordingly the county was divided into five districts with a District Superintendent in charge of each district. All the suburban area surrounding Flint, in which the highway problems are somewhat different than in the rest of the county, was placed in one district. Headquarters for this district remain at general headquarters. The balance of the county was roughly quartered to form four districts, each with a District Superintendent. Storage garages have been set up at Otisville, Montrose and Linden. Headquarters is still functioning in Flint. Plans have been completed for the construction of a garage at Atlas in



● **MOTOR graders are essential in winter maintenance and Genessee County owns 24 of them. This is a Warco, 100 hp, tandem drive. It is used for heavy snow removal work.**

● **OPERATIONS are kept going with a minimum of lost time; this tank wagon fuels equipment on the job, furnishing gasoline and diesel fuel. It has 2-way radio.**

this district during 1955, to which district headquarters will be moved before the end of the year, completing the decentralization which was started three years ago.

In addition to its responsibilities for the improvement and maintenance of county roads, the Road Commission has a contract with the Michigan State Highway Department for the maintenance of state trunk lines located in the county. There are 134 miles of state roads covered by the contract, all of which are paved except four miles; 35 miles are four-lane and the balance two-lane. The state roads carry a much heavier volume of traffic than any other roads in the county; consequently these roads have priority in emergencies. As a matter of fact, emergency work is carried on simultaneously on both state roads and county pavements, but when the going gets tough, all effort is concentrated on the state roads. The organizational setup for the state work is similar to that in the five districts previously mentioned; headquarters are located in Flint. Routine work on state roads is handled by this office throughout the county but in the case of snow and ice removal all districts participate.

Equipment

The acquisition of equipment might, too, be considered as a part of long range planning but since nearly all the equipment for snow and ice removal, barring snow plows and sand spreaders, is used all year long, it does not appear necessary to go into details on all items of equipment. One item of equipment which warrants special mention is radio. With men and equipment scattered all over the county, it is imperative that a means of prompt communication at all times to all parts of the county be available. Telephones have long been used and are still indispensable but radio can provide immediate contact in a great many instances where it would be impossible to do so with telephones. A few years ago a tornado passed through the county at night, killing more than a hundred people and destroying much property. Road Commission forces were assembled at the control garage in Flint and held there until such time as the Maintenance Engineer could reconnoiter the stricken area and plan approaches by circuitous routes to avoid traffic blockades on more direct routes. By radio all employees who could be located were directed where to go and by what route, and were advised as to the equipment that would be needed to open roads which were closed by fallen trees, power lines and telephone poles and other debris deposited on the highways by the tornado. Had it not been for the use of radio, the operation could not have been carried out without delays which would have required many more hours for the hospitalization of the injured.

Snow and ice removal are of an emergency nature and must be accomplished for the most part between shift changes at the factories. Radio enables the Maintenance Engineer to know just what is being done in any part of the county at any time, and with this knowledge, he can coordinate the whole undertaking.

Determining current winter needs is largely a matter of experience but past experience is not entirely reliable in providing for any particular winter. In order to be reasonably safe, plans are made for conditions more severe than those actually expected.

Snowfall in this area averages 35 inches a year, but occasionally—once every seven or eight years—the amount is double or even more than that. Therefore, it is always necessary to keep in mind that possible bad year in making preparations for the whole road system may be blocked with snow for several days. Eighty-five snow plows are available for use but, during many winters, it is not necessary to use a single snow plow. Actually our problem is rarely snow removal, but every winter we are faced with an ice removal problem. A one-inch fall of snow in colder parts of Michigan would go unnoticed; but in this county a one-inch fall of snow, which is invariably wet and heavy, would require the attention of the entire crew. Because of heavy traffic, the wet snow is packed down as rapidly as it falls and has to be removed as ice. Obviously, effort must be concentrated on preparations for removing ice. A substantial part of the ice encountered is formed from rain—sometimes mixed with snow—which falls when the temperature is below 32°F and which in aviation circles would be classed as rime. Snow and rain storms in the winter are marked by falling barometric pressure, and usually higher temperature, and are followed by rising barometric pressure and falling temperature. Any ice that is not removed before the lower temperature sets in will become increasingly difficult to remove. Therefore it is imperative that work start immediately after the storm strikes and continue until the storm has passed or as much longer as may be necessary to clean up.

Our snow and ice removal is based on the assumption there is no satisfactory substitute for a bare pavement in the winter. We are cognizant of the fact that sand or other abrasives are used on ice as an alternative to ice removal in

many cases. There are no doubt economic factors that justify such treatment in certain areas, and certainly using an abrasive on ice is desirable protection to traffic and can easily be justified under certain conditions, such as low traffic roads in localities having low mean temperature. In this county complete ice removal on paved surfaces is justified by high traffic volume.

A large percentage of winter storms strike at night, and to make sure attention is given the roads without delay in such cases, the roads are patrolled all night. If a storm strikes any time at night in any part of the county, the patrolman decides whether the severity of the storm warrants calling out a crew or whether it is safe to wait for the regular day crews.

If conditions require calling out a crew, the patrolman radios the central garage where a small night crew is kept on duty making minor equipment repairs. By telephone, the employees needed are requested to report for work. Usually within half an hour after the call is sent out, employees start reporting and in a short time the equipment required is under way. While there is not sufficient warm storage for all the equipment, enough can be kept in warm storage to insure immediate starting of motors of trucks equipped with salt spreaders. In case ice forms on pavements and in case of heavy snow, a sufficient number of trucks on which snow plows are mounted can be started without delay. Several 100 hp motor graders are also kept in readiness for any emergency. Every effort is made to have the principal roads free of snow and ice before the early morning factory shifts start to work. Factory workers know just how long it takes to go from their homes to the factory and any loss of time usually leads to higher speeds and an increase in the number of accidents; hence the desirability of preventing delays.

Keeping the Men Busy

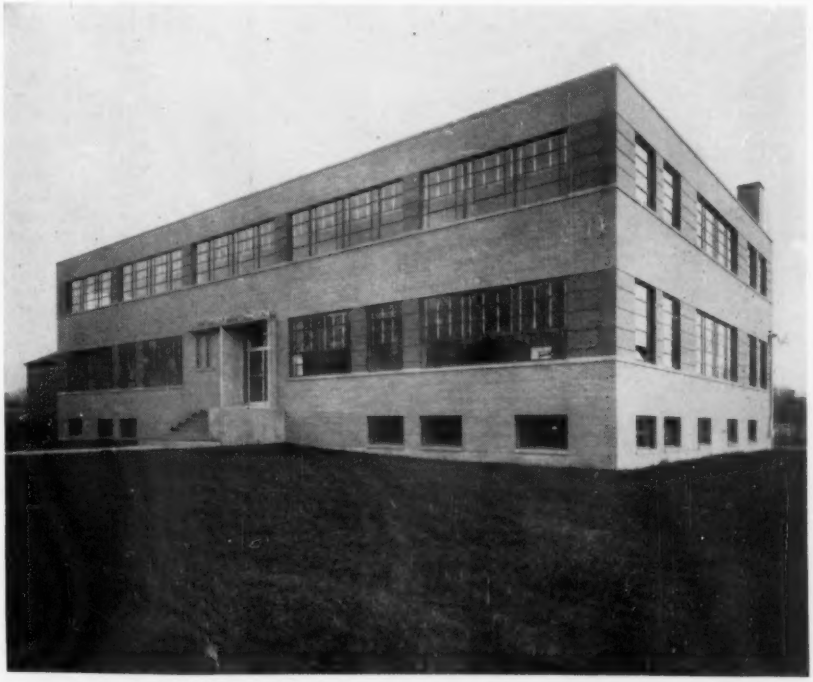
The lot of supervisory employees is tougher during the winter than at any other time of the year. There is a long-standing policy in the organization that any employee who reports for work is permitted to put in a full day. Cleanup after a majority of storms is of short duration and not infrequently there are days, sometimes weeks, between storms. Providing work, and at the same time keeping equipment in readiness for the next storm, often taxes the ingenuity of supervision. Operation of a gravel plant during the winter provides employment for a few and cleaning up roadsides and cutting brush provides employment for a still greater number. While chemical treatment is depended upon to keep brush from growing on the highway right-of-way, there is still a large mileage where the brush is too large for satisfactory chemical control. This mileage can support plenty of winter work but, unfortunately, most of these roads are classed as County Local Roads for which there are sufficient funds to carry on only the most needed winter services. Actually, only 20 percent of the income for county roads can be used on local roads. The removal of dead trees, which endanger highway traffic, keeps one crew going when not required for emergency services. Cleaning ditches, for which three Gradalls are used, can be carried on until the ground freezes. Early snows, which sometimes stay on the ground, prevent frost penetration and occasionally permit ditch cleanouts all winter long. The Road Commission operates three county parks in which pavilions and other structures are repaired during the winter. The building of tables, and installation of fireplaces and stoves, provide work for a few having the necessary skills. There is a certain amount of repairs to pavements that are subjected to heavy truck traffic during the winter, keeping a patching crew busy a greater part of the time. Many other jobs require occasional attention, but work planned for tomorrow may be interrupted by weather conditions that could not be foreseen.

If a winter is an average one, a good many things that were postponed in the summer and fall will have been handled before the winter ends. Highway service requires roughly 3000 tons of rock salt and a small amount of sand for county roads, and about the same amount of each for state roads. This will keep traffic moving without too many delays. Approximately $225 per mile is spent for snow and ice removal. The figure appears exorbitant at first glance, but when one considers that practically all the snow that falls is removed as ice, along with a certain amount of ice formed from rain, the cost does not appear so high.

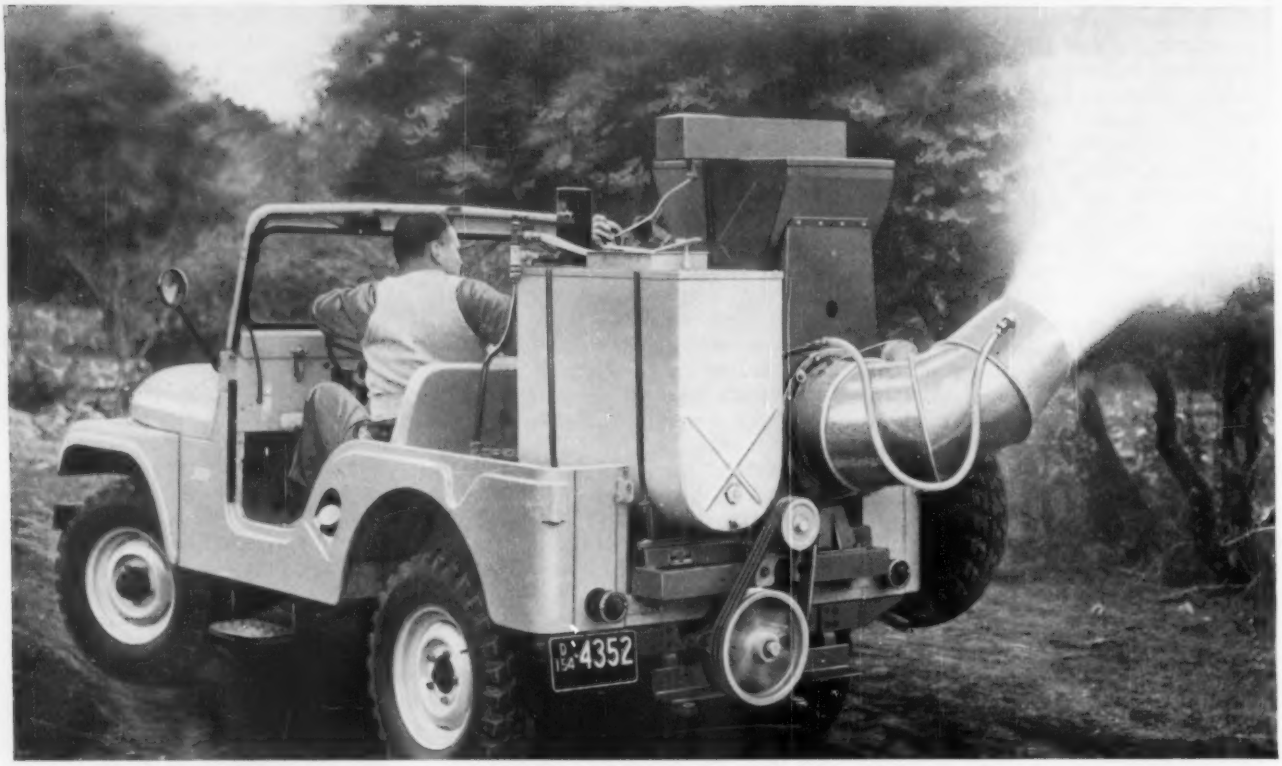
• • •

Water and Sewerage Construction Costs

Annual report for 1954 of the Division of Sanitary Engineering of the Maryland State Department of Health reveals that water supply construction amounted to $15,246,-217.30 and sewerage construction amounted to $10,116,780.93 in the state of Maryland during 1954.



● **OFFICE building of the Genessee County Road Commission, modern and attractive in appearance, is located in Flint. Repair and storage facilities are located nearby.**



Spraying. The Universal 'Jeep', with power take-off, operates many types of sprayers and dusters. With the extra traction of its 4-wheel drive, the 'Jeep'-sprayer unit reaches remote places for mosquito and weed control work—over sand and soft ground—up 60% grades—where other vehicles can't go. But it shifts easily into conventional 2-wheel drive for speedy travel between jobs.

How the 4-wheel drive 'Jeep' family does more jobs better...faster!

Mobile power. With power take-off, the 4-wheel drive 'Jeep' Truck is a mobile power unit for operating many types of equipment, such as welders, generators and compressors.

Transportation. The 4-wheel drive 'Jeep' Station Wagon carries up to 110 cubic feet of equipment and supplies or 6 adults—supervisory personnel and workmen—wherever they need to go.

Maintenance. The 'Jeep' is an ideal vehicle for maintenance work, such as operating a grader blade. With power take-off, it operates almost any belt or shaft-driven equipment.

Members of the 'Jeep' family of 4-wheel drive vehicles are proving their value and versatility every day in every phase of public works and public service.

They spread their cost over an almost endless number of jobs, and their "go-anywhere" dependability is extra insurance in public emergencies.

Ask your Willys dealer for an on-the-job demonstration of these all-purpose, time-saving, money-saving 'Jeep' 4-wheel drive vehicles, or write for information.

The 'Jeep'® family of 4-wheel drive vehicles

WILLYS... makers of the world's most useful vehicles

WILLYS MOTORS, INC., TOLEDO 1, OHIO

APWA News

AMERICAN PUBLIC WORKS ASSOCIATION
1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Special Report on Organization of Public Works

The increased interest in the organization and reorganization of municipal public works departments has brought forth many requests for current information regarding the characteristics of existing organizations. The American Public Works Association therefore conducted a survey, in the Spring of 1955, to obtain the type of information most frequently requested in the inquiries received by the headquarters staff. The results of this survey are included in *Special Report No. 20; Municipal Public Works Organizations,* which has just been released.

This report, which was prepared by Robert D. Bugher, Assistant Director of the Association, includes a discussion of the basic organizational structure of municipal public works departments with an illustrative organization chart which can be used as a starting point from which modifications can easily be made.

The administrative lines of authority existing in forty-eight (48) municipalities ranging in size from approximately 5,000 to 500,000 population are presented with the population, form of government, number of employees in each organized unit and its corresponding operating budget. The types of functions assigned to the directors of public works departments, city engineers and superintendents of streets are listed, as well as, a breakdown of the percentage of their time devoted to various types of work. Salary data and a chart showing the average age and employment record of public works officials are other examples of the type of information included in this new report which is available from the American Public Works Association, 1313 East 60th Street, Chicago 37, Illinois. List Price $2.00 per copy (forty percent discount to members).

Landfill Demonstrations for APWA Congress Visitors

Special demonstrations of sanitary landfill operations were sponsored by the Allis-Chalmers Manufacturing Co. during the American Public Works Congress and Equipment Show in Milwaukee. The demonstrations were held at an area type fill being constructed in a large hole formerly filled with water. Because the bed is soft, the refuse, in this case non-combustible, is dumped from the top into the hole. Large piles of dirt are stockpiled behind the fill to supply material for the 3-in. cover placed at the end of each day's operations. On weekends, newly-filled areas are covered with 8 or 9 inches of dirt.

The accompanying picture shows a 105-hp, 16-ton Allis-Chalmers HD-11G tractor shovel with a 2¼-yd. bucket being operated during one of the demonstrations. A bus shuttle service was provided for visitors to the landfill site, which is located northeast of the city.

Ed Decher Convalescing

Latest word from the office of Edward P. Decher, newly elected APWA President, tells us that Ed is continuing his convalescence at the Presbyterian Hospital, 27 South Ninth Street, Newark, New Jersey, following a heart attack suffered at his home on October 11th. His many friends send their sincere wishes for a speedy recovery.

Iowa Meeting Draws Big Turnout

Over 100 members and guests attended the third annual meeting of the Iowa Chapter held at Cedar Rapids. The Honorable Milo J. Sedlacek, Mayor of the host city, extended a cordial welcome to the public works officials of that state. Carl Fagerlind, Street Commissioner of Waterloo, was elected president of the Chapter to succeed Carl Smith, Asst. Health Officer of Cedar Rapids. Kenneth Cullen, City Engineer of Dubuque, was named Vice-President, and Eli N. Eastman, Supt. of Sewers for Waterloo, was re-elected Secretary-Treasurer. Headlining the speakers on the two-day program was the Honorable L. A. Touchae, Mayor of

Waterloo, who gave an interesting talk on "The Growing Problems of Cities and Towns." Other speakers were: Hubert M. Fayman, Commissioner of Motor Equipment, Kansas City, Mo., whose topic was "Specification Writing for Equipment Purchases;" John Anderson, City Engineer, Marshalltown, whose paper dealt with "Equipment Uses and Their Flexibility;" and a third prepared by Joseph P. Bruno, Street Commissioner of Rockford, Illinois, covering "Equipment for Refuse Collection." Peter F. Roan, led a discussion of these papers.

Paul V. Roberts, Director of Public Works, Sioux City, presided at the second day's sessions which included the presentation of several informative papers. The first was, "Inter-Department Relations" by Leonard P. Howell, City Manager of Des Moines; the next titled, "The Value of Planning and Zoning to a Community" by Lloyd Wegner of the Cedar Rapids Planning Commission; another presented by Quentin Wildman, City Engineer of Boone, covered "Utility Planning" and the last was entitled, "The Federal Urban Road Program" which was delivered by W. E. Reed, District Engineer of the U. S. Bureau of Public Roads. The excellent program arranged under the direction of Carl Smith, the retiring president, also featured a display of equipment by the local dealers in that area.

Ohio Chapter Meets in Toledo

John Alspach, Director of the Department of Public Service of Toledo presided at a meeting of the Ohio Chaper of APWA which was held in Toledo in conjunction with the 4th annual Ohio Municipal Conference sponsored by the Ohio Municipal League. Leo F. Flotron, Chief Highway Engineer of Dayton, and Secretary-Treasurer of the Chapter reports that the program included a technicolor-sound film, "The Big Road," which was shown through the courtesy of Frank Converse, President of International Hoisting Engineers of Cleveland, and a talk on "Toledo's Expressways," by David C. Colony, of the host city's Engineering Division.

Also appearing on the program were Charles Heidschuch, Superintendent of the Highway Maintenance Division of Cincinnati's Department of Public Works, who gave a talk on "Street Resurfacing" and Arthur D. Caster who discussed the "Sewage Treatment Program for Metropolitan Cincinnati."

California Chapters Hold Fall Meetings

The fourth meeting of the San Diego-Imperial County Chapter was held at the Mission Valley Country Club in San Diego. Virgil Larson, Right-of-Way Engineer for the Pacific Telephone and Telegraph Company, was installed as president of the chapter for the coming year. A work simplification program entitled "Work Smarter—Not Harder" was presented by Messrs. Kopotic and Ryan of the San Diego Department of Public Works. A preliminary report of a committee studying problems involved in the placing of utility poles on rear lot lines was submitted. The committee plans to prepare a booklet on the subject which will serve as a guide for planners and engineers in that area.

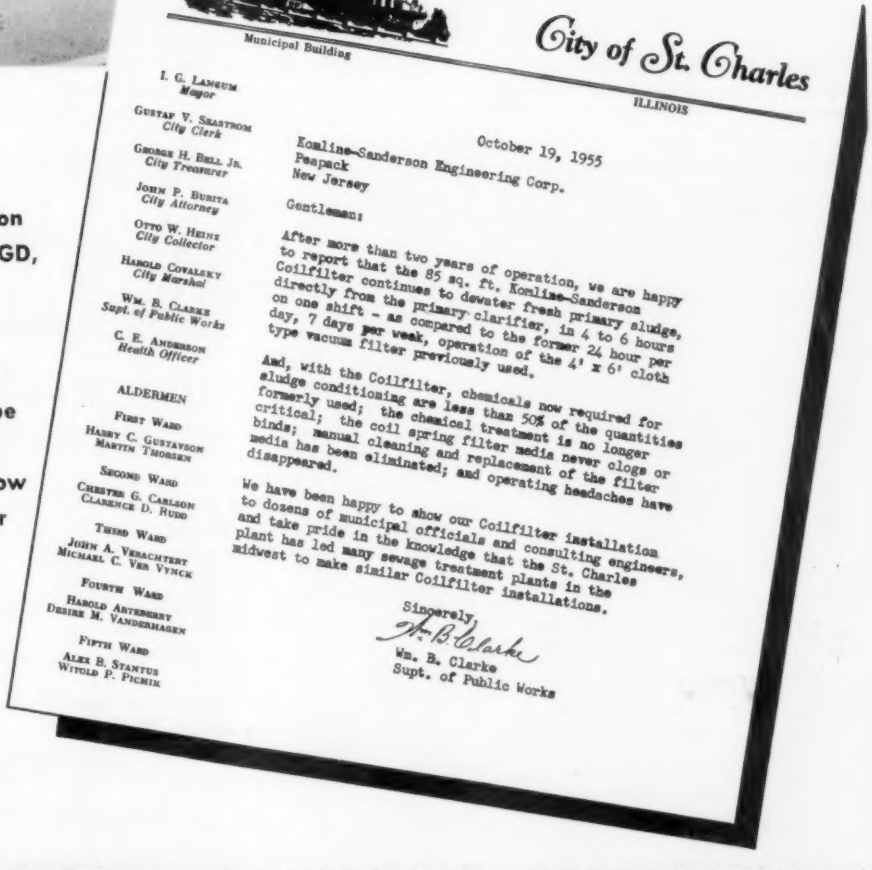
Forty-seven members and guests were present at a meeting of the Northern California Chapter which was held in Oakland. Dr. J. C. Geiger, Health Officer of the City of Oakland, gave an interesting talk on his experiences as a Public Health Officer with Public Works Officials. John Morin, City Engineer of Oakland and President of the Chapter

(*Continued on page* 101)

COILFILTER solves sludge dewatering problem at St. Charles, Ill.

St. Charles, Illinois, operates a trickling filter plant for a population of 10,000; average flow is 0.64 MGD, with a maximum of 0.96 MGD.

In September, 1953, a 7' x 4' COILFILTER package unit started operation, replacing another type of vacuum filter. All of the fresh sludge produced by the plant is now dewatered in 95 to 106 hours per month. The letter at right tells what St. Charles thinks of their COILFILTER.



Municipal Building

City of St. Charles

ILLINOIS

I. G. Langum, *Mayor*

Gustaf V. Skaastrom, *City Clerk*

George H. Bell Jr., *City Treasurer*

John P. Burita, *City Attorney*

Otto W. Heine, *City Collector*

Harold Covalsky, *City Marshal*

Wm. B. Clarke, *Supt. of Public Works*

C. E. Anderson, *Health Officer*

ALDERMEN

First Ward
Harry C. Gustavson
Martin Thorsen

Second Ward
Chester G. Carlson
Clarence D. Rudd

Third Ward
John A. Verachtert
Michael C. Van Vynck

Fourth Ward
Harold Artesberry
Desire M. Vandermaagen

Fifth Ward
Alex B. Stantus
Witold P. Pichnik

October 19, 1955

Komline-Sanderson Engineering Corp.
Peapack
New Jersey

Gentlemen:

After more than two years of operation, we are happy to report that the 85 sq. ft. Komline-Sanderson Coilfilter continues to dewater fresh primary sludge, directly from the primary clarifier, in 4 to 6 hours on one shift - as compared to the former 24 hour per day, 7 days per week, operation of the 4' x 6' cloth type vacuum filter previously used.

And, with the Coilfilter, chemicals now required for sludge conditioning are less than 50% of the quantities formerly used; the chemical treatment is no longer critical; the coil spring filter media never clogs or binds; manual cleaning and replacement of the filter media has been eliminated; and operating headaches have disappeared.

We have been happy to show our Coilfilter installation to dozens of municipal officials and consulting engineers, and take pride in the knowledge that the St. Charles plant has led many sewage treatment plants in the midwest to make similar Coilfilter installations.

Sincerely,

Wm. B. Clarke

Wm. B. Clarke
Supt. of Public Works

Write for Bulletin No. 103

KOMLINE-SANDERSON ENGINEERING CORPORATION

Peapack, New Jersey

MANUFACTURERS OF COILFILTER SLUDGE VACUUM FILTERS

Now's the time to mail this month's Readers' Service Card.

Washington news

Presented in cooperation with the American Public Works Association and through the courtesy of the Washington Office of the American Municipal Association

Public Works Loans

Interest rates for loans for public works to cities and other municipal bodies have been determined by the Community Facilities Administration. A basic rate of 3¾ percent has been set for loans secured by general obligation bonds and 4¼ percent for loans secured by revenue bonds or other types of obligations. Both rates apply to 30-year loans. They will be adjusted for longer or shorter amortization periods. Loans for streets and gas distribution systems and any authorized public works are available to public agencies unable to borrow necessary funds at reasonable rates and terms. Applications for loans are available at regional offices of the HHFA located in New York City, Philadelphia, Atlanta, Chicago, Fort Worth and San Francisco.

State and Local Governments Spend Record 37 Billion

The Bureau of Census' newly-published *Summary of Governmental Finances in 1954* shows that state and local governments spending rose 11 percent to a record level of $36.6 billion in the past fiscal year. The rate of increase from 1953 to 1954 was slightly higher for the 48 state governments than for the 117,000 local governments, although the rise was substantial for both levels. Increases of $1.2 billion in annual expenditure for education, $0.6 billion in state payments for unemployment compensation benefits, and $0.5 billion for highways were the larger elements in the 1953-1954 rise.

Federal spending during the same period was cut back 4 percent, with the result that the total public expenditure of all governments remained at the same level in 1954 as in 1953. A drop of $3.7 billion in the national defense bill was offset by a rise in non-defense spending by federal, state, and local units. The combined 1954 outlay of all governments amounted to about $680 per capita, $288 of which went to national defense.

Among the levels of state and local government, the $7,198 million spent by school districts represents the sharpest increase—16.6%—over 1953. Direct state disbursements, not including aid to local units, climbed 13.4 percent to $13.008 million; while township spending ($993 million) virtually kept pace, with a 12.5 percent increase. In order of rate of increase, municipalities follow with an 8.3 percent rise to $7,198 million. County governments spent $4,266 million or 5.8 percent more than last year. Almost no change in expenses is shown by special districts, which accounted for $1,332 million of the entire state and local outlay in 1954.

Federal Airport Aid

Policies and procedures for administering the expanded Federal Aid Airport Program have just been announced by the CAA. Under the new rules, $42.5 million of federal aid will be allocated to communities, "irrespective of population." Priority will be given to construction which promotes airport safety and efficiency. Funds are made available on a matching basis with the Federal government contributing up to 50 percent of the total cost. Applications should have been submitted by December 1, in order to be considered in this year's program. Applications previously submitted for which no allocation was made under the regular $20 million Commerce Department appropriation should be resubmitted, on the basis of the new program. Additional information and application forms are available at the nearest office of the District Airport Engineer.

Urban Highway Routes Announced

Locations of 2300 miles of urban sections of the National Interstate Highway system have been announced by the Bureau of Public

Roads in a publication entitled "General Location of National System of Interstate Highways." Bypass routes, loops, spurs, and beltlines in and around over 100 cities are now included in the 40,000 miles of Interstate Highways authorized by Congress. The publication is available for 55 cents from the Superintendent of Documents, Washington, D. C.

Surplus Property

Look for more Federal land and buildings for sale in coming months. The General Services Administration does. This is the agency charged with disposing surplus Government real property. The expectation that more buildings, land and facilities will be declared excess stems from a directive sent to heads of all executive agencies by Budget Director Hughes. The directive told the department heads to "intensify" their efforts to find out what property the agency held was no longer needed.

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APWA News

(*Continued from page* 98)

presided at a breakfast meeting attended by 84 members of the APWA, at the Sir Francis Drake Hotel in San Francisco. This meeting was held during the 57th annual conference of the League of California Cities. T. Fred Bagshaw, Assistant Director of Public Works for the State of California, gave a very informative talk on highway problems.

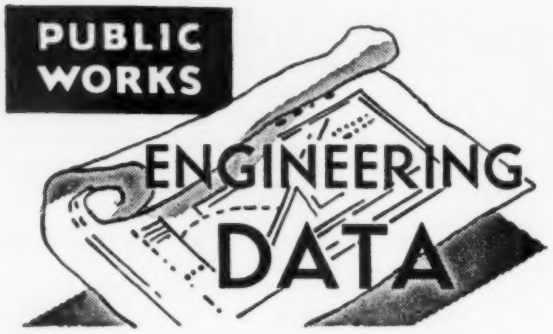
Texas Chapter Elects Hester President

The 9th Annual Meeting of the Texas Chapter of the APWA was held in Brownsville, Texas, in conjunction with the Annual Convention of the League of Texas Municipalities. These meetings attracted nearly 1,500 persons to the sun-soaked Rio Grande Valley.

The Chapter meetings, which were very well attended, featured a talk on "Expressways and Freeways" by Robert O. Lytton, Expressway Engineer, Texas State Highway Department, San Antonio; an address titled—"Study of Texas Highway Needs" by Rodman Porter, Research Associate, Texas Research League, Austin; and an informative talk on "Public Works Problems" by William L. Schupp, City Manager of McAllen. J. E. Williams, Superintendent of Water, San Angelo, encouraged public works officials in attendance at the meeting to support the activities of the American Water Works Association and Robert D. Bugher, Assistant Director of the APWA, reviewed highlights of the 1955 Public Works Congress which was held earlier in the month in Milwaukee, Wisconsin.

H. H. Hester, Superintendent of Streets, Ft. Worth, was named President of the Chapter at the annual business meeting to succeed J. R. Hennan, Superintendent of Public Works, Port Neches. J. P. Burden, City Engineer of San Angelo was elected Vice-President and Drahn Jones, Director of Public Works of Corpus Christi was elected Treasurer. M. M. Anderson. City Engineer of Abilene and F. L. Rockwell, City Engineer of Brownsville were elected to serve as Trustees on the Executive Committee. E. E. McAdams, Executive Director of the League continues to serve as Secretary of the Chapter, and C. C. Crutchfield serves as Field Representative for both the League and the Texas Chapter of the APWA.

Public Works men joined with other municipal officials in the entertainment features of a program which included a Get-Acquainted Party and Buffet Dinner and a fun night in Mexico.



Michigan Scratches Itch Problem

During 1954, 24 miles of lake beaches were chemically treated by the Michigan Water Resources Commission to kill snails which carry swimmers' itch parasite. A total of 35.4 tons of copper sulphate was applied to the 12 lakes serviced.

Present method of handling problem leaves much to be desired. Treatment is contingent on application for service and cost sharing by individual owners. Requests are honored in order of receipt as long as state appropriation holds out.

Needed is a knockout punch delivered at all problem sites before swimming season starts. That would call for township or lake association ownership of equipment, state-trained and supervised operators, local subscription of funds.

Relatively few lakes are affected, not all beaches on those, and not all people are susceptible. But one itchy bout with the bug, by one member of the family, can mar a long-planned vacation.

Miniature Barricades for Training Purposes

A set of miniature signs, barricades and roadway sections, including hills, a curve and a straight stretch, were constructed out of sheet metal and plywood for use in a training course explaining the proper use of barricades. The signs were built in the sign shop of District 5, Texas Highway Department by Eugene Bradford, Wynn Breedlove, Louis Rabelais and J. J. McCullough, according to Texas Highways. In the training program, these signs, barricades and sections are used to simulate conditions encountered in actual maintenance work and to teach safe methods.

Fritz Engineering Lab—Lehigh University

A new addition has been made to the Fritz Engineering Laboratories, Lehigh University, Bethlehem, Pa. The Laboratory was established on the University campus in 1909. The original building, 94 x 115 feet, was fitted with an 800,000 lb. Riehle universal testing machine and seven similar machines of lesser capacity.

The new addition consists of a 7-story section 130 x 70 feet, plus a 4-story section 114 x 24 feet. A new tension compression machine has been installed in this new section and it is the largest universal testing machine in the world capable of applying both tensional and compressional loads up to 5,000,000 lb. Weight of the machine and accessories is approximately 925,000 lbs. and specimens or structures up to 40 ft. high can be tested in tension above the sensitive crosshead or in compression below the sensitive crosshead. Loads are applied hydraulically by a movable cylinder or a stationary piston 54-inches

in diameter which is mounted on the bottom of the base. Hydraulic pressure at maximum load is 2200 lb. per sq. in. The guaranteed accuracy of the load measuring system is within ½ percent of dial reading. Six load measuring scales are provided; the lowest of which has a capacity of 20,000 lb. on which load variations as small as 20 lb. can be indicated.

Pilot Line for Centerline Striping

When a highway is seal-coated, the existing centerline is covered over. Texas Highways describes a method devised in District 9 by J. W. Nichols, Maintenance Superintendent. A string is placed along the center of the existing center line immediately ahead of the crew placing the seal coat. Three men and a pick-up truck are used. Nails are placed 500 to 600 ft. apart and fence staples are placed over the string every 75 to 100 ft. Since the string may stretch, it is pulled tight at the nails before it is covered. Both nails and staples are placed closer on curves. The string line leaves a distinct impression after the new surface is placed and provides a guide for the striping machine. Also the impression is permanent and can be used until the next seal coat is placed. Cost is about $7.50 per mile.

Water and Sewer Construction in New Orleans

During 1954 there were 32.164 miles of water mains laid in New Orleans, Louisiana. This included steel, cast iron and asbestos-cement water distribution pipe. In the same period 300 hydrants were set and 283 gate valves installed.

There were 13.842 miles of sewer lines constructed during the year, with vitrified clay, cast iron and concrete pipe being used. The number of manholes constructed were 317.

Municipal Revenues, Expenditures and Debt Data for 1954

Municipal revenues, expenditures and debt for the Nation's 481 cities of 25,000 or more inhabitants, continued to rise at substantial rates during 1954.

Two-thirds of the general revenue came from local taxes. These taxes of various types brought in $3,943 million, 5 percent more than in 1953. Property taxes provided $2,926 million, sales and gross receipts taxes yielded $602 million and city licenses and other taxes $415 million.

General expenditure reached $6,107 million in 1954, 8 percent more than the 1953 level. The sharpest increase was in municipal sanitation expenditure, which rose 19 percent during the year and amounted to $696 million. There was spent $669 million for highways and police protection amounted to $633 million. Education was the largest single municipal function as measured by expenditure with $1,027 million being spent. Municipal fire protection cost $473 million and municipal operated hospitals spent $371 million and other municipal health and hospital services cost $147 million. This is just a part of the breakdown of the general expenditures.

Outstanding gross debt of the 481 cities rose 7 percent in 1954 to $12,162 million. Of city borrowing amounting to $1,542 million, $370 million was for utility purposes. Of city debt redemption totaling $728 million during 1954, $182 million related to utility debt. This data appeared in the "Compendium of City Government Finances in 1954" published by the U. S. Dept. of Commerce, Bureau of the Census.

PUBLIC WORKS DIGESTS

The WATER WORKS *Digest*

Safety in the Water Works Industry

The author calls attention to the "AWWA Manual on Safety Practice for Water Utilities," especially a few pertinent facts given herein. The water works industry has a higher rate of frequency for accidents than gas, electrical or communication industries, and the severity rate is the second highest. The most common types of injuries are bruises, contusions, cuts and lacerations, followed by sprains and strains, fractures, burns and eye injuries. The Manual tells how to start and to maintain a safety program.

"Safety Is No Accident." *Water & Sewage Works,* October.

Barriers to Prevent Intrusion of Salt Water

Intrusion of sea water into the underground water on which Southern California draws for its water supplies has presented such a serious threat that the State Legislature appropriated $750,000 for investigation and study under direction of the State Water Resources Board. That board in 1951 contracted with the Los Angeles County Flood Control District to install and operate an experimental recharge test. This article describes in some detail the tests made, and cites the conclusions reached, which are as follows:

The investigation of the prevention and control of sea water intrusion has established that, for an area with comparable geologic and hydrologic condition to the West Coast Basin:

1. Prevention and control can be successfully realized in a confined coastal aquifer by recharge through wells.

2. Recharge can pressurize a confined aquifer continually through a given reach, thereby reversing a preexisting landward gradient and preventing further sea water intrusion.

3. Recharge will provide significant replenishment to the inland ground water basin with only a relatively small oceanward loss of fresh water.

4. Recharge can be performed in an aquifer previously degraded by sea water intrusion and—within the physical limitations as established at the test site—will not have any consequential deleterious effect on inland pumped supplies. In fact, all evidence collected to date indicates that the degraded portion of the aquifer can be reclaimed by recharge through wells.

"Development of a Fresh-Water Barrier in Southern California for the Prevention of Sea Water Intrusion." By Finley B. Laverty and Herbert A. van der Goot, Los Angeles Co. Flood Control Dist. *Jour., Am. W W Ass'n,* September.

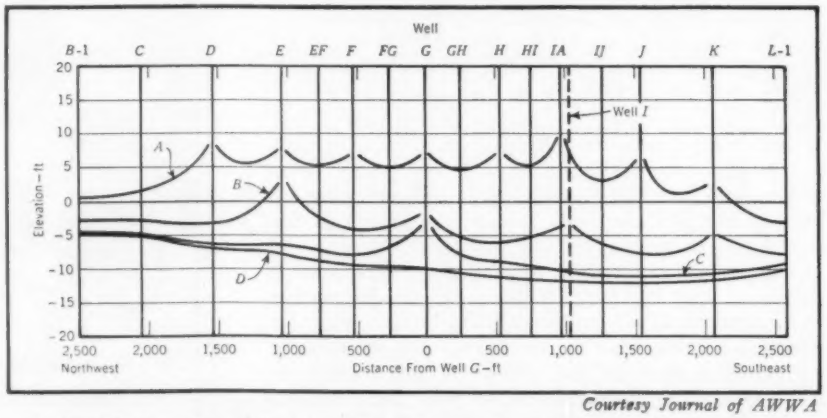
Methods of Iron Removal

There are three general methods of removing iron from water—aeration, precipitation plus solids-contact and zeolite softening. For aeration, use is made of open coke trays, open slat trays, and closed forced draft and pressure diffusers. In open tray aeration, it may be necessary to add an alkali if excessive CO_2 is present. Smaller equipment units are necessary for closed forced draft or pressure diffuser aeration, especially the latter. When hardness and turbidity removal is required also, a solids-contact unit is effective. When softening as well as iron removal is desired, zeolite softening is often used. Which of these processes is best for any given case will depend upon the amount of iron present, the presence of organic matter tending to bind the iron, and the desire to soften or otherwise treat the water.

"Seven Methods of Iron Removal." By H. R. Fosnot, Graver Water Conditioning Co. PUBLIC WORKS, November.

Experience With Recharging Ponds

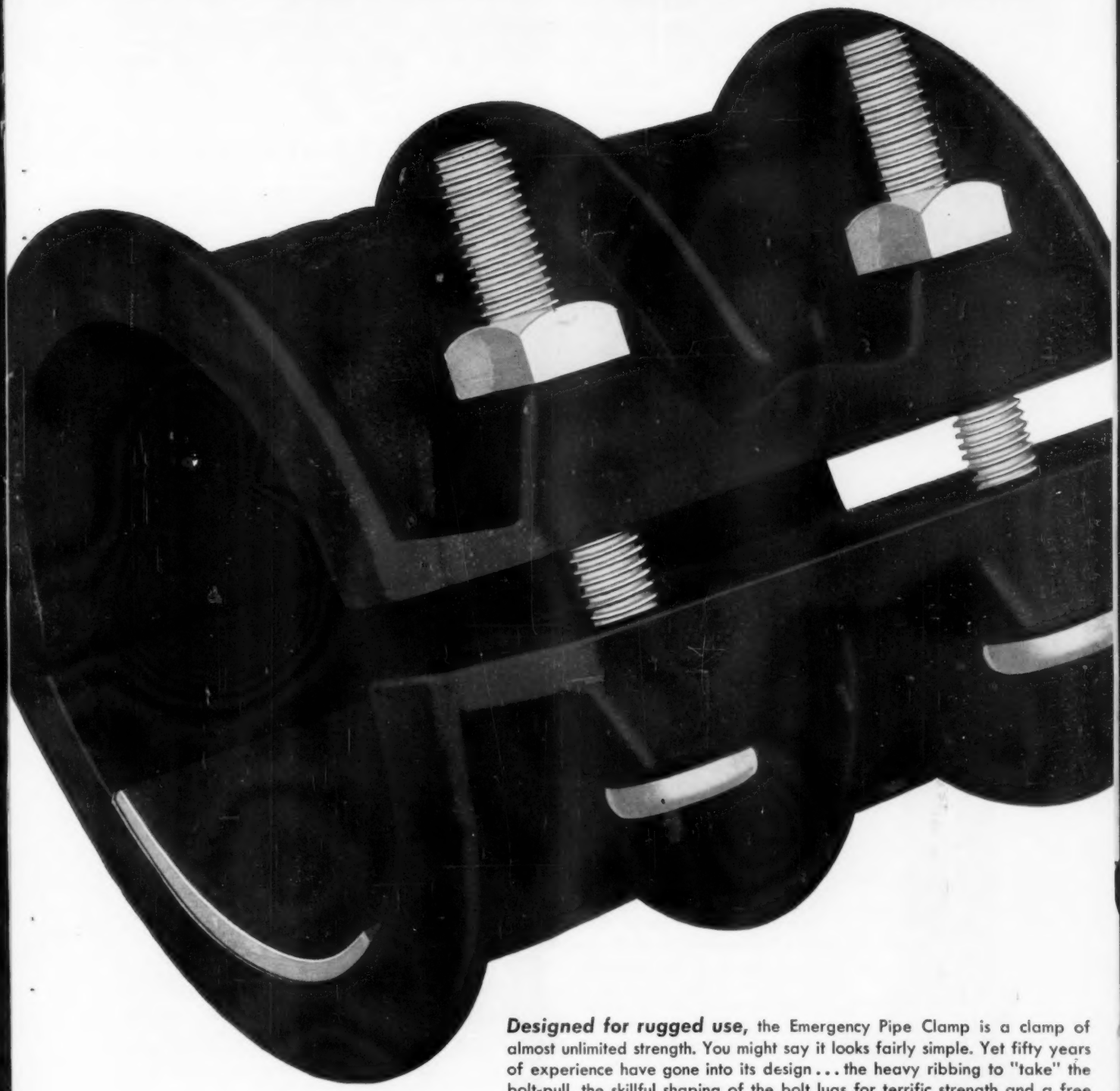
The Upjohn Co. in 1951 completed, 5 miles from Kalamazoo, Mich., a plant using 5,000,000 to 9,000,000 gpd of water. Some of it is reused as much as five times. Since 1952 efforts have been made to conserve local ground water by means of recharging clean, warm waste water; and as a great deal of land area was available, it was decided to use recharging ponds instead of wells. A reasonably rapid percolation rate was possible, which was assisted by maintaining as large



Courtesy Journal of AWWA

● **GROUND water profile parallel to the coast at line of recharge barrier.**

THE CLAMP WITH GUTS!



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a head of water as was possible without pumping. It was found that the outdoor air temperature lowers that of the pond water—as much as 23° in winter. The earth further cools the water, whose velocity is 1¾ ft. per day, at the rate of 1° for each 19 ft. of travel through the earth. The recharge water flows into the drawdown cone of depression of the company's wells. There is contamination danger to nearby wells when poor quality water is recharged. A natural pond used for recharging returns 16 percent of the well water drawn from the ground, and a new artificial pond recharges 9 percent.

"Recharge Operations at Kalamazoo." By W. H. Sisson, Constr. Eng. for Upjohn Co. *Jour., Am. W W Ass'n,* September.

Advantages of The Membrane Filter

The best defense against a biological attack is quick and reliable detection procedures so that administration of serums and antibiotics may begin at once. Standard procedures require four days in some cases. Organisms that are concentrated and cultured on a membrane filter may be counted in as little as 8 hours and positively identified within 16 hours. The new MF procedures are much more sensitive, accurate and reliable than former techniques. Before this method becomes the basis for establishing potable water quality and any complete abandonment of older methods occurs, it is clearly desirable to confirm the validity of results in the hands of a large number of laboratories to be certain that no extraordinary circumstances or water conditions are overlooked in evaluating the method and also to establish that the method is workable and gives reproducible results. It is now being used in virus research and a wide range of clinical medical applications. It provides more sensitive and simple methods of monitoring radioactive air-borne hazards.

"The Membrane Filter Applied to Water Supply Control." By John H. Bush, Millipore Filter Corp. *Water & Sewage Works,* October.

Asphalt Panels Line a Reservoir

A 5-mg reservoir of the San Pablo, Calif., filter plant, lined with concrete 30 years ago, has been made practically watertight by use of an impervious, reinforced, molded asphaltic material furnished in 4 x 25-ft. panels ½-in. thick. Joints were made with an asphaltic cement applied cold to a lapped joint or a butted joint with an overlay strip. The leakage closely approached the contractor's guarantee of 5 gpm. The contract cost was 39 cents a square foot.

"Asphalt Panels Line Reservoir." *Engineering News-Record,* Oct. 13.

A Combined Ground And Surface Water Supply

The National Petro-Chemicals Corp. in 1951 selected a site near Tuscola, Ill., for a plant requiring 3,000 gpm of water initially and expected to increase to 5,000 gpm. Two sources of supply were considered—well water drawn from the "Mahomet" preglacial valley, or from Kaskia river, which flows within a half mile of the plant site. The nearest site for wells of adequate capacity was 20 miles away. The river supply would, gaugings indicated, supply 3,000 gpm 78 percent of the time, but the flow is nearly zero for long periods of drought, and there is no practicable location for a large storage reservoir. The plan finally adopted was

to use the river water, supplemented when necessary by well water. A pipe line for bringing water from the wells would cost about $1,000,000. The river flowed near the proposed well site and it was decided to avoid the necessity of constructing the pipe line by pumping well water into the river and letting it flow to the plant site in the river channel. It was at first feared that the water would be dissipated by evaporation, transpiration and percolation; but study of locally collected data indicated that such loss would not exceed 33 percent of the water input, even if there was no river flow. The plant began operating in July, 1953, and during the following dry spell the transmission loss was only about 10 percent.

"A Combination of Ground and Surface Water for Industrial Supply." By R. D. Wilson. *Jour. Am. W W Ass'n*, September.

Shortcomings Of the Membrane Filter

The applications of the membrane filter to the bacteriologic examination of water possess many possibilities. However, in its present state of development the membrane filter procedure has many characteristics which prevent it from supplanting APHA Standard Methods test. Its limitations revolve about the large volumes of potable ground water samples necessary for routine examinations, the increased cost per analysis by the membrane filter technique as compared with the Standard Methods procedure, and the undesirable concentration of laboratory activity resulting from the use of the membrane filter.

This is the conclusion reached by the staff of the Nassau County, N. Y., Dept. of Health Laboratory. The large samples needed in the case of ground waters require the use of sample bottles of approximately one-liter capacity, which are impracticable for use on a field level. In some cases the membrane filter technique produces colonies whose visual characteristics are questionable as members of the coliform group. As to cost, the cost per sample is at least 10 cts. per membrane as compared with not over 7 cts. for media in the Standard Methods procedure. When used to test tidal waters, there is such an overgrowth of normal flora that, even with several decimal dilutions, counting is impossible.

"A Critique on the Membrane Filter." By Maxim Lieber, Assoc. San. Chemist. *Water & Sewage Works*, September.

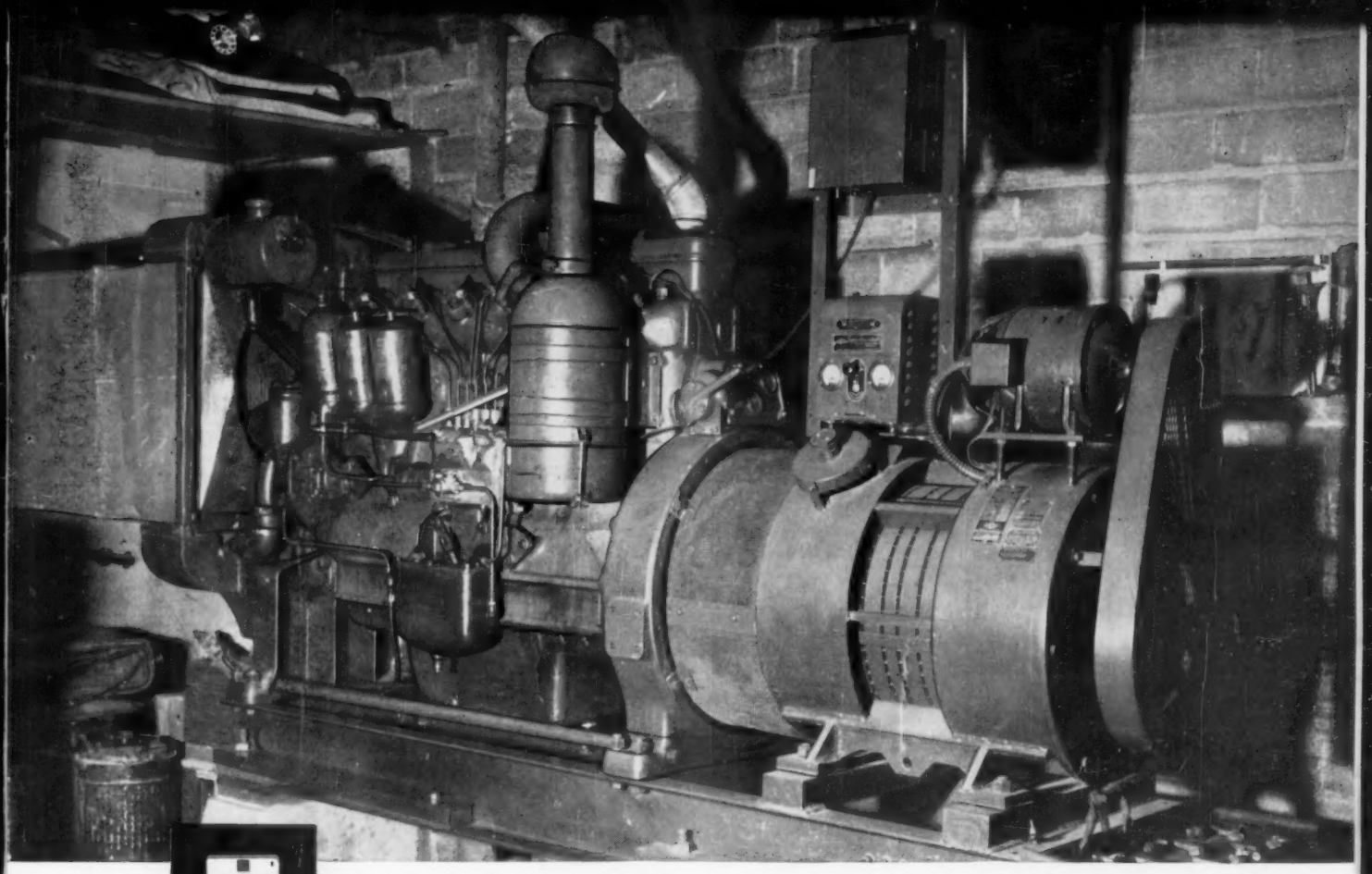
Integration of Water Supplies

Fairfax Co., Virginia, is a suburb of Washington, D. C., with a population of nearly 200,000. About 38 percent of these are supplied with water by 15 private companies and 4 public systems. With few exceptions, these are inadequate to meet the existing and rapidly growing demands for water. Water is obtained from wells or from the Potomac River. A plan is being considered for integrating most of these systems into a single system that can be served by a county-developed and operated supply taken from the Potomac River.

"Integration—Is It the Cure for Water Troubles?" *Engineering News-Record*, Sept. 29.

Other Articles

"Designing, Constructing and Maintaining **Centrifugal Pumps.**" By Roy Carter and Igor J. Karassik, Worthington Corp. Water & Sewage Works, September.



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"**Water Treatment** Reaches High Stage of Development." Achievements of several decades. By L. R. Howson. Civil Engineering, October.

"Our National **Water Resources Policy.**" By Clarence A. Davis, U. S. Dept. of the Interior. Jour. AWW Ass'n. September.

"Regional Water Supply **Planning for Northern Ohio.**" By Paul Belcher, V. P. First Nat'l Bank of Akron. Jour., AWW Ass'n, September.

"**Water Without Minerals;**" the world's largest mixed-bed water softening plant, used by the Consolidated Edison Co. of New York. By I. B. Dick, Asst. Chf. Chem. Eng. Water & Sewage Works, September.

"**Water Rights Policies** in the Southeast." By Clair P. Guess, Jr., State Soil Conservation Committee. Jour., AWW Ass'n, September.

"State **Water Resources Legislation** in 1955." Panel discussion by Stephen Bergen, Conservation Found.; and reports from 29 states. Jour., AWW Ass'n, September.

"**Use and Conservation** of Water Resources in Eastern States." By Richard D. Hoak, Mellon Inst. Jour., AWW Ass'n, September.

"New Wells Assure Water for **Montgomery, Ala.** Public Works, November.

"The **Usk Reservoir** Scheme of the Swansea Corporation," England. Design and construction. Water and Water Engineering (England), September.

"Meter **Maintenance** Cuts Water Waste, Increases Revenue in Hollywood, Fla." With about half of the meters out of order in 1953, a program of meter repair reduced the annual pumpage by 73 mg and increased the paid-for water by 17 mg. By Bennett R. Bolen, Director of Finance. Public Works, November.

"Water Treatment at **Norfolk, Virginia.**" History since 1873. By S. M. Hodges and W. G. Beazley, Div. of Water Supply. Water & Sewage Works, October.

"**Storage for Large Maps** and Plans." Details of constructing a rack for hanging a thousand sheets. By Dora H. Parker, Alabama Dept. of Public Health. Water & Sewage Works, October.

"Interference by Industrial Wastes in the **Mohr Test** for Chlorides." By Michael J. Taras, Dept. of Water Supply, Detroit, Mich. Water & Sewage Works, October.

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Southerly Sewage Plant Cleveland, Ohio

The Southerly Sewage Treatment Plant serves a total of 58,400 acres of the City of Cleveland and neighboring suburbs having both residential and industrial areas contributing over 55 million gallons of sewage daily. The total population of the area served by this plant is estimated at 400,000. The cost of operation and maintenance in 1954 was over $477,325. The original cost to build the plant plus improvements to date (1955) was over $16,500,000.

• • •

Operation of Milwaukee Sewage Treatment Plant

During 1954, the Milwaukee, Wisc., plant treated an average of 162 million gallons of sewage daily, and 61,698 tons of Milorganite were produced. The treatment process brought about an average reduction of 95% in bacteria, 94% in biochemical oxygen demand, and a removal of 93% of suspended solids, resulting in a clear effluent being discharged into Lake Michigan. The market demand for Milorganite exceeded its production. The returns from its sale were less than the cost of processing the sludge, but to dispose of it in other ways would entail even greater costs.

PUBLIC WORKS DIGESTS

The INDUSTRIAL WASTE Digest

Solving Air Pollution Problems

An air pollution problem is potentially solvable in each of three phases: (1) The sensitivity of humans, plants, and animal life; (2) The source of contaminants; (3) The mechanism by which contaminants are dispersed. Wind tunnel scale model experiments apply to the third phase. The presence of an inversion area over the region of plume dispersion can be unfavorable because the stack gases are dispersed downwind causing greater ground level concentration. The location and magnitude of maximum concentration of contaminants are affected by wind speed, atmospheric turbulence, and other factors, with stack height of extreme importance. Maximum concentration occurs at a downwind distance of ten stack heights under normal conditions. Increase in turbulence brings the maximum concentration closer to the source. As wind speed increases, the ground level concentration will vary from a minimum of little or no value, through a maximum figure when the gas plume is nearly horizontal, to a point of decrease where the diluting effect of increased wind speed predominates. Analyses of concentration characteristics by scale model experiments have been most successful where the problem is complicated by short stacks.

"Wind Tunnel Scale Model Studies of Air Pollution from Industrial Plants." By Gordon H. Strom, New York University. *Industrial Wastes*, Sept.-Oct.

Treating Chromate Wastes

The chromate wastes at the Channel Master Corporation plant, Ellenville, New York, include plating bath discharge and wastes from running rinses. The firm is engaged in the manufacture of television antennas, and all steel parts require plating, first in a zinc cyanide bath followed by chromate dipping and rinsing. Increasing contamination of the dip bath requires periodic discharge. An ion exchange system was found adaptable to treatment of these wastes and was made a part of the plating operation by using it for both recovery of chrome and purification of the dip solution. Chromic acid is recovered from the rinse waters and returned to the plating baths. The demineralized water resulting is used for rinsing plated material. Since the plant is periodically used to purify the dip bath, the frequency of replacing the bath is reduced resulting in a saving of $3000 per month. This saving is based on the reduction of bath replacement and the elimination of chemicals which would have been required if treatment other than ion exchange were employed. A further benefit is closer chemical control with improved plating.

"Plating Waste Treatment and Chrome Recovery." By Edmond J. Quinlan, Channel Master Corp., Robert J. Keating and Arnold L. Wilcox, Graver Water Conditioning Co., *Industrial Wastes*, Sept.-Oct.

Biological Treatment Of Industrial Wastes

There is a widespread belief that biological methods of waste treatment, particularly the activated sludge process, must be conducted under very closely controlled and well defined conditions to produce satisfactory results; pH must be between 7 and 8; temperature kept practically constant; sludge fed daily, etc. Many industries produce wastes with pH above or below the optimum, wide fluctuations in temperature, and prolonged periods of starvation. This subject has been investigated under a grant from the National Institute of Health, U. S. Public Health Service, and the following conclusions reached:

1. Adaptation of activated sludge to temperature change is immediate.

2. Temperature fluctuations at 12-hr. intervals between 10° and 30° C. (50°-86°F.) is not detrimental to sludge quality.

3. Biological purification of wastes with pH ranging from 5 to 11 can be accomplished by activated sludge, provided acids are not formed to depress the pH below 5.

4. The pH effects are a function of temperature. At low temperatures the effects are magnified. Thus, closer attention should be paid to pH control during the winter than the summer.

5. Levels of pH above 9 are definitely inhibitory at 10° C. and levels above 10 are definitely inhibitory at 20° C.

6. The decision concerning the degree of neutralization prior to treatment should be based on an engineering cost study comparing the cost of chemicals with larger plant facilities.

7. Automatic pH control is required when treating wastes that offer the threat of decreasing the pH below 5 due to acid formation.

8. Activated sludges may be starved for periods of at least 3 weeks without seriously impairing their purification capacity. Full purification capacity will be restored in 2 to 5 days after resumption of feeding at full load.

"Revised Concepts on Biological Treatment." By Clair N. Sawyer, Prof. of San. Chemistry, M.I.T.; John D. Frame, research engineer; and John P. Wold, U.S.P.H.S. *Sewage and Industrial Wastes*, August.

Research In Air Pollution

Public Law 159, passed by the 84th Congress authorized appropriations to the Dept. of Health, Education, and Welfare for the next 5 fiscal years from July 1, 1955, to provide research and technical assistance relating to air pollution. The Surgeon General of the USPHS will direct the program. Actual appropriations for the program are still subject to the Budget Bureau review and action by Congress. The recent session of Congress approved $595,000 for air pollution investigations in the regular PHS budget and also an additional sum of $1,190,000 following passage of PL 159, making a total of $1,785,000 for the fiscal year ending June 30, 1956. These


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funds are allocated to the Division of Sanitary Engineering Services and the Division of Special Health Services for direct and contract research, research grants (to be administered through the National Institutes of Health), training, and some $400,000 for transfer to other federal agencies for cooperative studies, as to the Weather Bureau, Bureau of Mines, and Bureau of Standards. Examples of types of projects which may be conducted more economically in private or public laboratories or institutions through contract research are: 1. Development of specialized instrumentation for field measurement of specific air pollutants; 2. Investigations of atmospheric pollution problems requiring temporary services of specialized personnel; 3. Estimation of economic effects of air pollution; 4. Problems related to dispersal of air pollutants which might be studied by use of wind tunnels; 5. Development of index plants for measuring levels of air pollution; 6. Development of air cleaning devices and equipment. Characteristic research grants recommended by the National Advisory Health Council and approved by the Surgeon General are: A comprehensive Study of the Effects of Air Pollution on Health; Determination of Acute and Subacute Biologic Effects of Air Pollution; Physiologic Response to Atmospheric Pollutants; Effect of Smog on Pulmonary Functions in Man; and Atmospheric Pollution by Aero-allergens.

"Atmospheric Pollution." By Louis C. McCabe, *Industrial & Engineering Chemistry*, October, 1955.

Treating Paper Wastes

In approximately five years, the extent of waste treatment among the paper industry has increased from 37% of all mills to 55%. In ten years, about seventy million dollars have been spent for waste treatment plant construction by the industry. With a limitation on the number of undeveloped mill sites in the country, it is likely that the increased requirement of the population for paper and paper board production will take place at existing mills. It appears that the increased flows resulting from the expansion might modify the requirement for treatment. Industry must take an active part in formulating water resource development projects in order to compete with other consumptive uses. There is a need for regulatory agencies to formulate long-range programs, recognizing the need for utmost utilization of water as a multiple-use resource. There is also a need for cooperation between state agencies and industry in pollution control.

"Waste Treatment, Water Resources and Expansion Problems." By Russell L. Winget, National Council for Stream Improvement. *Industrial Wastes*, Sept.-Oct.

Digesting Meat Packing Wastes

For more than two years, Auckland, New Zealand operated two pilot plants in an investigation of methods suitable for treating meat packing wastes. One plant employed conventional sedimentation, filtration and/or activated sludge. The other plant was used to determine the feasibility of anaerobic digestion, as a pretreatment, followed by a trickling filter and oxidation pond; the digested effluent was given secondary treatment in the other plant. The 5-day BOD of the wastes ranged from 1,000 to 4,000 ppm. It was found that the most acceptable secondary treatment was single-stage high-rate filtration combined

Beaumont, Texas installs Densludge Digestion and four 195′ Dorrco Distributors

Among the more unusual new installations in the United States is the 30 MGD Ultra-Modern Plant now serving Beaumont, Texas. Employing the Biofiltration flowsheet followed by Densludge Digestion, the plant is designed for a population load of 200,000 with room for expansion.

Unusual at Beaumont are four 195′ Dorrco Distributors . . . among the largest ever manufactured. The primaries are rated at 15 MGD each under a head of 3.2 ft. while the secondaries handle 30 MGD *each* at a 2.75 ft. head. Also unique is the use of Densludge Digestion incorporating two Densludge Thickeners to concentrate the solids to 6-7½% prior to digestion.

As this new plant at Beaumont shows, there's a Dorr-Oliver unit for practically every step in every sewage treatment flowsheet. Write for a copy of Bulletin No. 6041 which covers the complete line.

Here's the equipment installed at Beaumont: 1 40′ Dorr Detritor • 4 155′ dia. Dorr Secondary Clarifiers 4 155′ dia Dorr Primary Clarifiers • 2 195′ Dorrco Primary Distributors • 2 195′ Dorrco Secondary Distributors 2 50′ dia. Dorr Densludge Thickeners • 1 80′ dia. Dorr Multdigestion System • 6 Dorrco Plunger Pumps

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Engineering Consultants: FORREST & COTTON, Dallas, Texas

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with activated sludge treatment. Anaerobic digestion with a retention period of two days at a temperature of 80° F produced effluents of polluting strength similar to those of domestic sewage. The gas produced contained 70-75% methane. It was concluded that reducing the characteristics of the wastes to those comparable with domestic sewage would be feasible by digestion; to be followed, if necessary, by conventional trickling filters, activated sludge, or oxidation ponds.

"Treatment of Auckland Meat Wastes." *Public Works*, October.

Photographic Wastes Treatment

In the manufacture of photographic film at the Parlin Plant of the E. I. du Pont de Nemours & Company, waste material produced include ethanol, methanol, acetone, diacetone alcohol, gelatin, and minor amounts of silver salts. The suspended solids reactor appeared to offer the most promising method of handling the wastes of the several methods considered. Laboratory tests of actual waste samples indicated that a high degree of purification with reasonable costs might be expected. Operating experiences with a pilot plant indicated that satisfactory activated sludge can be maintained provided the pH is kept in a range of 6.5 to 8.5. With the pH of the influent waste below 5.0 or above 9.0, operation of the unit is upset. Peak loads in excess of 100 lb./day BOD can be handled satisfactorily in the 10′ x 6′ pilot plant unit, although with a decrease in per cent of BOD removal. The activated sludge will thrive at temperatures between 70° and 100° F. Solids are not required in the feed in order to maintain the activated sludge. When wastes have a wide range of characteristics, provision must be taken to maintain the pH and temperature automatically within the desired limits, and the plant will probably require 24-hour, seven-day week supervision. In general the results of the pilot plant trial indicate that the plant wastes described can be successfully treated in equipment of this type.

"Organic Waste Treatment in a Suspended Solids Reactor." By R. W. Haywood, Jr., and G. A. Olson, E. I. du Pont de Nemours and Co. *Proceedings, Industrial Session, Texas Water and Sewage Works Association's Short School, 1955.*

Industrial Wastes and Municipal Sewers

If an industry is appropriately situated and discharges a waste which is amenable to treatment with sewage, use of the city sewer system by the industry should be given consideration in the interest of economical waste disposal for the whole community. The feasibility of the procedure also depends upon the establishment of an equitable sewer service charge and a sewer ordinance indicating the basis upon which a municipality may accept a waste. The ordinance should contain a list and description of materials which cannot be received in the system, a definition of the concentration of typical sanitary sewage in the city, the basis for charging for service, procedure for connection, and prohibition against use of the sewer for disposing of relatively clean water. If the wastes and sewage are of similar strength, the service charge could be a percentage of the water rate. Special rate formulas developed are of four basic types: the flat rate formula, the quality-quantity formula, the California formula, and the joint committee formula. In developing a specific rate formula, consideration should be given to the fact that a

sewage treatment plant and major interception portions of the system benefit the entire area and should be financed by all properties whether connected or not. Maintenance, operation, and replacement of the minimum treatment plant can be charged against the users. These same factors applying to future capacity are chargeable to the properties.

"Acceptance of Industrial Wastes in Municipal Sewer Systems." By Kenneth S. Watson, General Electric Co. *Industrial Wastes*, September-October.

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Trickling Filter For Supernatant Treatment

To find the limitations of a trickling filter for treating sludge supernatant liquor which is about three times as strong as settled sewage, research is being conducted at the University of Texas Experiment Station by J. H. Sorrels and P. J. A. Zeller. This highly putrescible liquor results from the anaerobic decomposition of sewage sludges in the digester. It has a high ammonia content and a high bicarbonate alkalinity. Most sewage treatment plants dispose of this material by feeding it slowly into the sedimentation tanks, a practice which often results in interference with normal operation.

In the Station's experimentation supernatant liquor from the digester at the College plant will be fed onto four experimental filters. Flow rates will be controlled by a constant head tank and organic loadings determined during sampling periods. Analyses of samples of applied supernatant and filter effluents will be made for (1) biochemical oxygen demand, (2) nitrogen (ammonia, nitrite, and nitrate), (3) solids (suspended and volatile), and (4) alkalinity and pH.

• • •

Cost of Water Mains Installed in Augusta, Maine

Augusta, Maine, installed 13,457 feet of water distribution mains in 1954. There were 8,534 feet of 10-inch cast iron pipe which was laid at a cost of $5.50 per foot. The 3,281 feet of 8-inch cast iron pipe was laid at a cost of $5.10 per foot. The 6-inch cast iron pipe cost $4.05 per foot for 1,217 feet. There were 425 feet of ½-inch and 1-inch plastic pipe which cost 42¢ per foot. This data is from the 1954 Annual Report of the Augusta Water District.

Essentials in Planning Township and County ROAD IMPROVEMENTS

ROY E. JORGENSEN,
Engineering Counsel,
National Highway Users Conference

This is an outline of remarks by Mr. Jorgensen before the School for Highway Superintendents held recently at Cornell University

THERE ARE two things that I want to dwell on particularly with regard to planning local road improvements. They are not concerned specifically with the kind of roads you build or the way you maintain them. They deal rather with providing a basis for determining what the improvement needs are, when they should be made and how to tell the story to the public.

Basic to the most elementary planning is a continuing inventory of the road system. One might say, "We do that. We know exactly how many miles of road we have and we have a county map which shows where they are."

I agree that is an inventory of a sort and it doubtless is kept up to date, as any inventory, must be if it is to be effective. But, record of miles and location of roads is really only a partial inventory. It is important to know what the roads are, how wide, what kind of surface and the structural condition. It is necessary, too, to know what kind of service the road provides. How many motor vehicles use it on an average day? To what degree does it perform special traffic service for school buses, mail routes, milk pick-up, etc.?

When you have this kind of information, as well as the miles of road and a map, you are in a position to do some planning. You can, by using certain standards of width and surface type for different traffic volumes, determine how much of the road system is up to standard and, conversely, how much is not and therefore needs improvement. You can also see which roads fall farthest below the standard and you can set up a basis for priorities.

To be of real value the inventory must be alive. It is not enough to make it once and develop a plan from it. It must be kept up to date from year to year. Then, it reflects significant changes—changes in the roads and in the traffic they carry. It shows progress by relating the inventory to previous years. And, it presents the needs problem on a fresh basis with an up-to-date priority schedule. These are the things a "live" inventory will do. Local road officials in different parts of the country are showing an awareness of the value of such inventories and real studies have been made in setting them up. The County Commissioner's Association of Wisconsin established last year a procedure for inventorying and road rating which is now applied to county trunk highways in all counties of the state. Harford Co., Md., has a simple but effective procedure which has been used for several years. Likewise, Maricopa Co., Ariz., and King Co., Calif., have initiated road inventory procedures that have proven of continuing value. The procedures used in the different places have varied but the aim is the same—to get an objective evaluation of the road system, section by section, and to present a priority schedule for needed highway improvements.

The other aspect of planning that I shall emphasize is one which is a logical follow-up of the inventory and the products obtained from it. This is reporting to the public—annual highway program reports.

My enthusiasm for getting effective program reports stems from two sources. First, as a citizen of a town in Connecticut for a number of years, I saw the results of good annual town reports in developing understanding and interest in the town activities and in obtaining support for town programs. Second, in the last several years with the National Highway Users Conference, I have been continually impressed by the potentialities for obtaining public understanding and support for highway programs through the use of easy-to-read reports to the public. State highway departments are devoting more and more attention to this and the results are indeed significant. Reports do not need to be elaborate or involve expensive reproduction. They do need to be informative and easily comprehended. They should present a clear picture of the highway situation, what is being done and what needs to be done. Each local road official should explore the possibilities of making his road inventory a little better. He will find it a helpful tool in carrying out his responsibilities and a basis for presenting the road situation in an effective manner.

MACHINES AGAINST DISASTER

Repeated floods in New England this fall have pointed up how immeasurably greater the long-time losses to community life and industry would have been had not modern machines been available to expedite restoration of normal facilities. With machines, the work of an army with picks and shovels was done in days by small forces, and at lower cost. Nor was all this work done on the surface. Even pipe cleaning organizations are swamped with work in New England, restoring capacity to sewers disrupted by the floods.

Chaos being swiftly turned into order by a Caterpillar D6 tractor and bulldozer in flood-ravaged Putnam, Connecticut. Powerful machines started work throughout the stricken areas as soon as waters had receded to restore vital utilities and roads and bridges.

A Hough Payloader tractor shovel plus clamshell and trucks make short work of tons of mud dumped by Hurricane Hazel at a Woonsocket, R. I. factory.

Homelite flood lights and chain saws team up to clear away fallen trees. This work went on around the clock, thanks to nighttime flood lighting.

PUBLIC WORKS DIGESTS

The HIGHWAY AND AIRPORT Digest

Federal Aid for Two-Way Radio Systems

Highway departments that do not have a two-way radio system or that need additional units for their existing system may be eligible to receive federal assistance under civil defense rules, to defray as much as 50 percent of the cost. The rules and procedures for obtaining such assistance are set forth in detail in Manual M25-1 (Revised) of the Federal Civil Defense Administration, entitled "Federal Contributions." Most state directors of civil defense will advise and help those who wish to apply for such assistance.

"Two-Way Radio Systems and Civil Defense." *Better Roads*, September.

Importance of Drainage In Winter Maintenance

The maintenance of drainage systems is a most important and essential part of any successful winter maintenance program. A study by the Bureau of Public Roads of maintenance on 247 miles of state highways, both rural and urban, for a 12-month period was the basis for conclusions stated in this article. During this year an average of 1430 laborers were employed on maintenance; 30 percent of the man-hours were required on snow and ice control and an additional 13 percent on drainage maintenance. Preparations for winter began in August. It included cleaning catch-basins, grates, gutters and ditches; cleaning catch basins and sumps, drain pipes and drainage structures. Pavement cracks and joints were sealed. Shoulders were patched and reshaped for the purpose of getting water away from the surface. In November, snow fences were erected and salt and sand stockpiled. During the winter, ditches and catch basins were kept clean of ice and snow. (Most highway departments use steam for catch-basin thawing.) Culverts should be inspected frequently, particularly after storms.

Existing roads are being rehabilitated and reconstructed, and this should include perfecting the drainage facilities. It is advisable for each maintenance engineer to review his drainage maintenance experience and be prepared to advise those responsible for designing and constructing the improvements on the roads under their supervision.

"Winter Maintenance and Drainage." By H. A. Radzikowski. Bureau of Public Roads. PUBLIC WORKS, November.

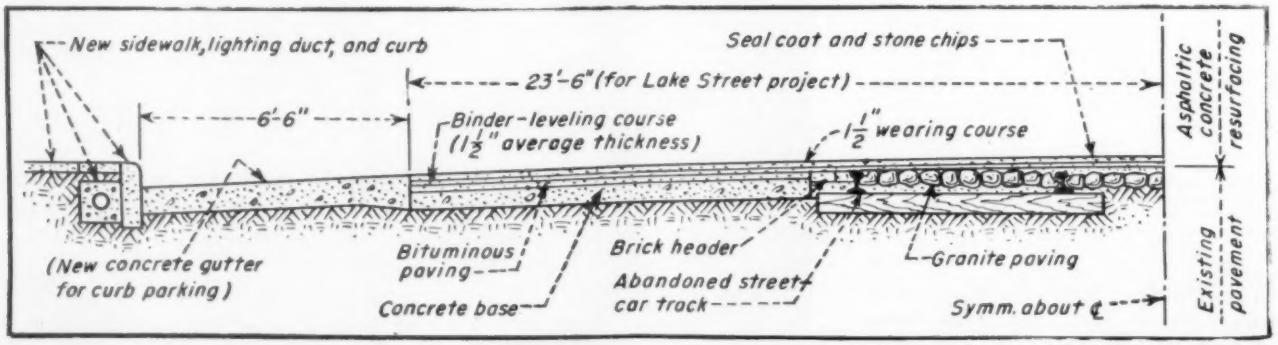
Construction of a $60 Million Bomber Base

The construction of a bomber base at Plattsburg, N. Y. includes a 300 x 11,760 ft. runway; a 75 x 11,-200 ft. taxiway; four 75 x 1050 ft cross-over taxiways; and a 1080 x 8,000 ft apron; on a glacial lake bed consisting in general of medium to fine sand with a trace of silt. The grading and paving with concrete of these areas are estimated to cost $15 million. This article describes the methods and equipment employed by the contractors in this construction; and in solving a special foundation problem for the heavy embankment involving clay underlain by silt. For the latter, the Corps of Engineers specified the use of sand drains and a 3-ft surcharge for a period of about 9 months. The sand drains were 6-in. holes drilled with hand augers, 9 to 15 ft deep on 15 to 20-ft centers, and filled with pervious sand. The contractors are having difficulties keeping their equipment mobile in the sandy going. Their improvisations include batch truck towing methods and the largest array of jumbo off-road type sprinklers and water haulers ever seen on an eastern project.

"Bomber Base in a Sea of Sand." By Harold J. McKeever, Editor. *Roads and Streets*, October.

Paving Over Abandoned Street Railway Tracks

Minneapolis, Minn. is in the midst of a $4 million street improvement program, which includes improving about 100 miles of old pavements containing abandoned street car tracks. These are left in the street because, although they could be



Courtesy of Engineering News-Record

● **METHOD used in Minneapolis for paving over abandoned street railway tracks; the program includes 100 miles of work.**

sold for $20 a ton and removed for $15 a ton, rebuilding the old roadbed for bituminous surfacing is estimated to cost about $2.50 per ton of rails removed. This resurfacing falls in two categories; in one, a 30-ft width of asphaltic concrete is laid over the old pavement and rails; the other includes widening the roadway, strengthening the old pavement and resurfacing with asphaltic concrete and new curbs and gutters. This article describes a project of the latter type on 26 blocks of Lake St., estimated to cost $525,000. The plans provide a 6½-ft parking space along each side of the street, which is practically a portland cement gutter of this width. This leaves 47 ft. between the parking lanes for four lines of traffic. At bus stops the paved gutters are widened to 10 ft. for a distance of 80 ft. In resurfacing over the rails, these are covered with a minimum of 3 in. of asphaltic concrete applied in two layers. Most of the bituminous paving and finishing operations follow generally accepted practices. But the engineers have developed special techniques of compacting. They found that the steel-tired rollers didn't work the asphaltic material sufficiently into the interstices between the cobblestones and bricks of the old pavement, but traffic did so later, causing slight surface depressions at such points. This is prevented by rolling with self-propelled rubber tired rollers, followed by use of steel-tired rollers. As newly laid asphalt is too hot and soft for immediate use of rubber rollers, it is first rolled lightly with steel-tired ones.

Where resurfacing over the street car tracks only is necessary, a 30-ft. width of bituminous concrete is laid in two 1½-in. courses, with the outer edges tapered to meet the existing pavement. The tapered edges are joined with the old surface by a 12-in. wide tack coat of hot asphalt cement just ahead of laying the new asphalt material.

The city uses its own equipment and labor for this purpose. It has operated its own asphalt plant for nearly 40 years; owns a completely integrated automatic ready-mix portland cement concrete plant and a fleet of transit-mix trucks; and maintains 17 construction crews totaling about 400 men.

"Street Resurfacing Is a Science in Minneapolis." *Engineering News-Record*, Oct. 13.

Traffic Counts On Secondary Roads

Many counties rely on their state highway departments for traffic counts on their highways. Some states loan traffic counters to counties, and some counties own mechanical counters, others make manual counts. Most of the county officials replying to a questionnaire agreed that the use of mechanical counters, as compared to a manual check, is the best and in the long run the least expensive method of obtaining reliable estimates of total travel. Counts are made for periods ranging from 24 hours to an entire week, depending on the kind of traffic using the road and the type of information desired.

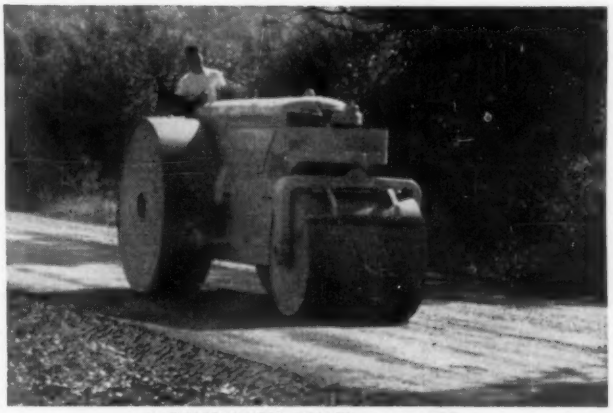
"Traffic Counts on Low-Volume Roads." *Better Roads*, September.

Strengthening an Old Concrete Airfield Base

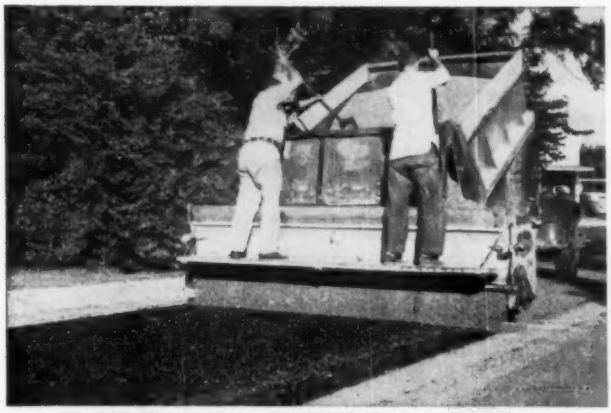
After the war, the Federal government turned over to Richmond, Va. the Richard F. Byrd flying field, used during the war as a fighter base. The pavement system included three runways 300 x 5,000 ft, designed for a 25,000-lb. wheel load, for which 6 in. of plain concrete on

Plant Mixing of Bitumuls Retread Aggregate Speeds Indiana State Road Reconditioning

A MODERN TRAVEL-PLANT CONTINUOUS MIXER lays down a perfect carpet of Bitumuls Retread mix.



A THREE-WHEEL ROLLER compacts the Bitumuls Retread to final thickness.



TO PROVIDE A FINAL ARMORCOAT SEAL, the Retread surface is given an application of ¾" to #8 stone chips.

HALF-WIDTH APPLICATION OF STONE CHIPS on completed full width application of Bitumuls Retread.

EMULSIFIED ASPHALT RETREAD construction is completed without closing roads to traffic, when plant-premixed Bitumuls Retread Aggregate is fed to the job in controlled amounts. Laying of loose stone ahead of the actual job location is thus eliminated.

Over any existing sound but worn or uneven pavement, a two-inch emulsified asphalt premix binder course is laid. Normally such a binder course is of open texture. A final application of keystone ½" to #8 is spread just prior to rolling operations. This provides additional stability so the new pavement can be quickly opened to traffic.

"Versatile, Low-Cost" Say Indiana Engineers

Bitumuls Retread is suitable for resurfacing or new construction. In combination with Bitumuls Penetration, or used alone, it has wide application in reconditioning roads retaining a reasonably sound base. Indiana engineers, early users of this type of surfacing, made wide use of Bitumuls Retread on their highways. They find that a single pass generally is adequate for coating all stone. In West Virginia, Michigan, New York and California, highway engineers cite these advantages: (1) No heating is required to load or unload Bitumuls Retread, (2) Mixing operations are not handicapped by wet aggregate, (3) Greater spread in volume per day per unit.

With Bitumuls Retread, worn road surfaces are literally transformed in appearance, riding properties, and durability, at comparatively low cost. In addition the large volume possible with this simple reconditioning method makes it the *fastest* effective method available.

Call the Bitumuls Field Engineers near you for data on Bitumuls Retread or specifications on other Bitumuls emulsified asphalts you can use on a full range of construction types.

10 in. of gravel subbase had been provided. The use of the airport since then has increased until there now are 60 flights daily of planes, most of which have a maximum gross weight of 44,000 to 88,000 lb., with occasionally one of well over 100,000 lb. To strengthen the pavements to receive these loads, the Bureau of Engineering calculated that an overlay consisting of 2¼ in. of coarse binder and 1¼ in. of coarse grade surface would increase the capacity of the pavement to provide for wheel loads of 65,000 lb. A contract for such an overlay on the runway that had the greatest number of failures was awarded in 1954. The broken concrete sections were replaced with new concrete, and all old joint material and asphalt patching were removed and binder placed to a compacted depth of 1½ in., followed by 1 in. of top, both using 60-70 penetration asphalt. The contract price was $5.65 per ton. The CAA officials required the application of a light-colored seal coat to the center 150 ft, to eliminate a considerable portion of the heat waves arising from the runways in hot weather, which make it difficult for pilots to judge their height above the runway when landing. During 1955, an extension of this work costing about $300,000 has been constructed.

"Bituminous Overlay Strengthens Wartime Fighter Base." By Jack H. Gould, Assoc. Editor. *Roads and Streets*, October.

Leaves from Streets Sold as Mulch by Toronto

The cost of collecting and disposing of leaves in Toronto is compensated for by converting them into "leaf mold" and selling this or using it on the city's parks and gardens. The leaves are at first stored at six points as soon as collected, from which they are removed to the central leaf mold operation during winter and early spring, as labor and equipment are available. Here the leaves are piled in long heaps, each 50 x 100 ft by 10 ft high, seeded with screenings of finished compost. The heaps are kept moist and are turned over every 6 or 8 weeks for about two years. Sixteen heaps are in continuous operation. The turning over is done by a bulldozer. A finished heap is shredded by a Royer shredder and undesirable materials (bottles etc.) removed; and it is then shredded again and screened and bagged. It has a fertilizing value of 2-2-2 and a pH of 7.0. Mulch from oak leaves is prepared separately and sold as an acid leaf mold. An 80-pound bag of mold is sold for $1.00.

"Leaf Removal Pays Its Way in Toronto." PUBLIC WORKS, November.

Contracting Standardized Bridges

Pierce County, Washington, believes that contracting the construction of bridges provides greater returns from the money expended than does constructing by government labor, providing it is combined with competent engineering, good supervision and long-range realistic planning. To secure better bids from contractors, the county provides alternate plans; and, to encourage small contractors to bid, the bridges are so designed as to permit maximum use of such equipment as can be rented locally. Also, county engineers furnish advice to inexperienced contractors. This procedure, in a very short period of time, has provided the county with a group of extremely efficient contractors. During the past four years the county has replaced some 60 inadequate bridges, making maxi-

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. . . over miles of traffic intersections

There's fresh hope for congested city traffic. The new Electro-Matic® Master brings coordinated automation to traffic flow in large city areas. The centrally located system does all the complex electronic thinking to move traffic along miles of thoroughfares, smoothly and more efficiently than ever before possible.

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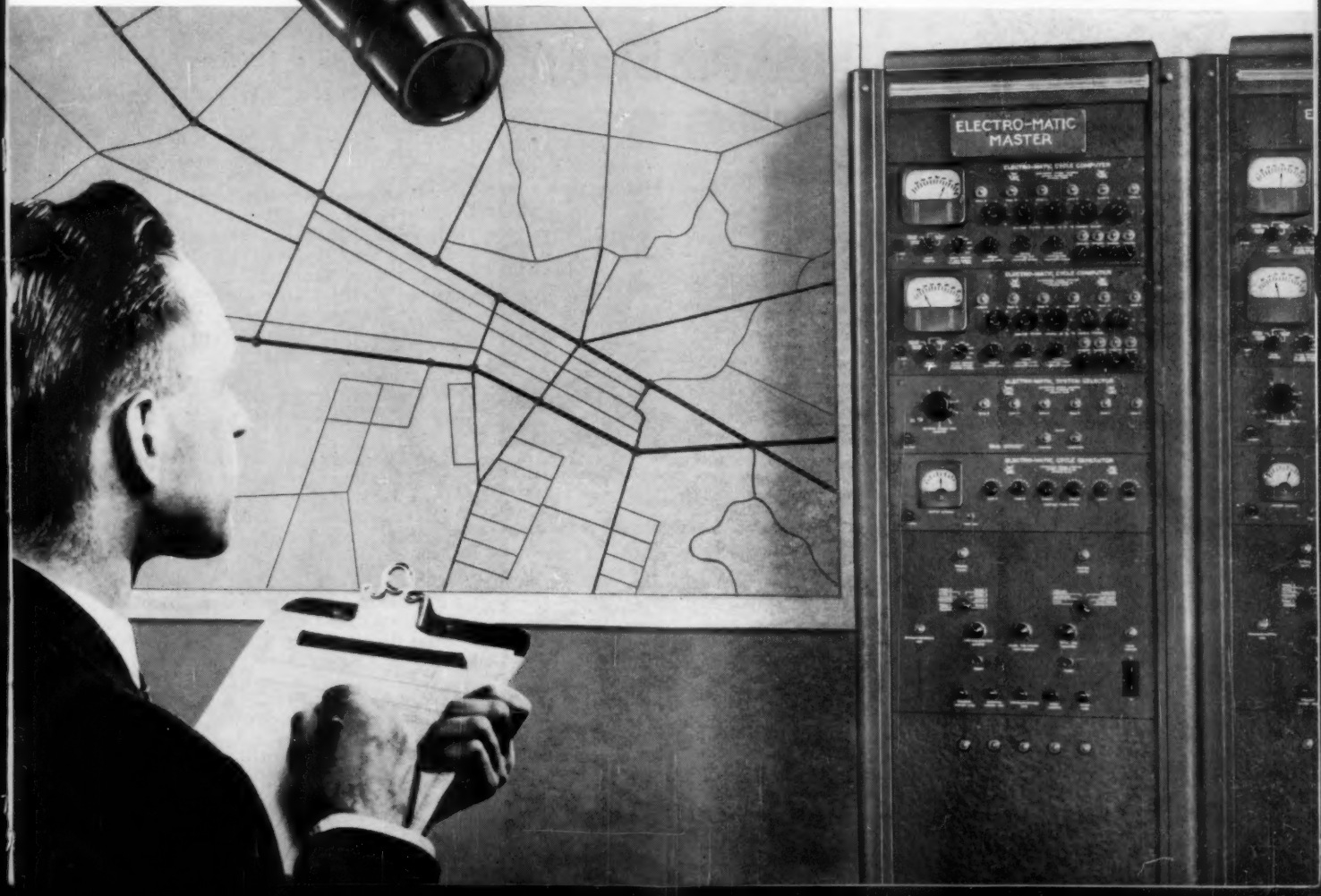


mum use of concrete for decking, substructures and piling.

"Standardized Bridges Are Built Better by Contract." By William A. Stancer, County Engineer. PUBLIC WORKS, November.

Variable Toll for Regulating Traffic

A Delaware Expressway is proposed to run 23 miles from Philadelphia at the new Delaware Bridge into Bucks County, Pa. In reporting on this, the Bureau of Municipal Research of Philadelphia and the Penn. Economy League advise that it be considered primarily as an industrial and commercial highway, to improve the area's ability to develop its economy and attract new elements to Philadelphia rather than to New York. To this end, commercial traffic such as trucks and buses would be given priority. This can be effected by making it a toll road, and varying the tolls with the time of day, the day of the week, month of the year, length of trip, and class of use. This would facilitate high speed for such vehicles. Car pools could be encouraged during peak hours by reducing the toll for passenger cars by 5 cts for each adult in addition to the driver.

"Regulate Traffic With Variable Toll Device." *Better Roads*, September.

Other Articles

"Compacting and **Finishing Machines** for Concrete Road Construction." A Survey of British developments. Contractors Record, Sept. 21.

"**Continuous Reinforcement** in Concrete Pavement—After 15 years." By Harry D. Cashell and Wilmer E. Teske, Indiana State Highway Dept. Roads and Engineering Construction, September. (Also Public Works for March, and Public Roads for February.)

"**Airphoto Interpretation** as an Aid in Materials and Route Locations." By D. R. Lueder, Photographic Survey Corp. Public Works, November.

"A Comparison of **Dry and Wet Sieving** of Mixed Aggregates and Fillers Used in Bituminous Mixtures" shows little difference. By C. M. Gough, Road Research Lab. Roads and Road Construction (England), September.

"**Seeding** an Emulsified Asphalt Mulching." By James A. Saunders, N. C. State Highway Com. Public Works, November.

"**Grade Separation**—The Radical Solution for Urban Intersections," in Paris, at least. By Gaston Vanneufville, Inspector General des Ponts et Chaussees. The Surveyor, Oct. 8.

PUBLIC WORKS DIGESTS

The SEWERAGE AND REFUSE *Digest*

Future Needs in Sewage Treatment

According to John H. Ludwig, chief of the economic section of the U. S. Public Health Service, efficiency of municipal sewage treatment plants must be increased just to maintain status quo in the face of population growth. At present, the discharge of municipal sewage to natural water bodies, after treatment, is equivalent to the raw sanitary sewage from 55,000,000 people. This would be reduced by 19,000,000 population if the current backlog of needs for sewage treatment facilities were constructed. The accompanying chart, based on present treatment methods and costs, shows the effects of growth in population and urbanization; also the BOD removals necessary to obtain various degrees of stream sanitation based on nationwide averages. Present per capita expenditures based on sewered population, if continued, would just be sufficient to take care of additional needs due to increased population and obsolescence. To attain a residual pollution discharge equivalent to 36,000,000 population, average per capita expenditures per sewered population would have to be increased by 86% to accomplish this in 10 years, by 40% in 20 years, and by 32% in 30 years.

"PHS Draws New Picture of Pollution Problems." *Engineering News-Record*, Sept. 22.

Oxygen Absorption In Aeration Tanks

A study of the mechanics of absorption of oxygen from air bubbles rising in spiral-flow aeration tanks led the author to conclude that, for such tanks of normally used depths, the diffuser plate area should be as large as is economical and practical. The smaller the air bubbles, the deeper the tank, and the greater the BOD loading, the more important it is to have a large air diffuser area. Instead of increasing the diffuser area, it may be possible to increase the time that the air bubbles are retained in the liquid by reducing the velocities of the overturning currents in the tank if these are more than necessary to produce adequate mixing. Improved knowledge of the mechanics of oxygen absorption by means of air diffusion should lead to future modifications and developments which will mean savings in the air and power necessary in the activated sludge process.

"Mechanics of Oxygen Absorption in Spiral Flow Aeration Tanks." By Henry R. King, Sr. Civil Eng., Chicago San. Dist. *Sewage and Industrial Wastes*, August.

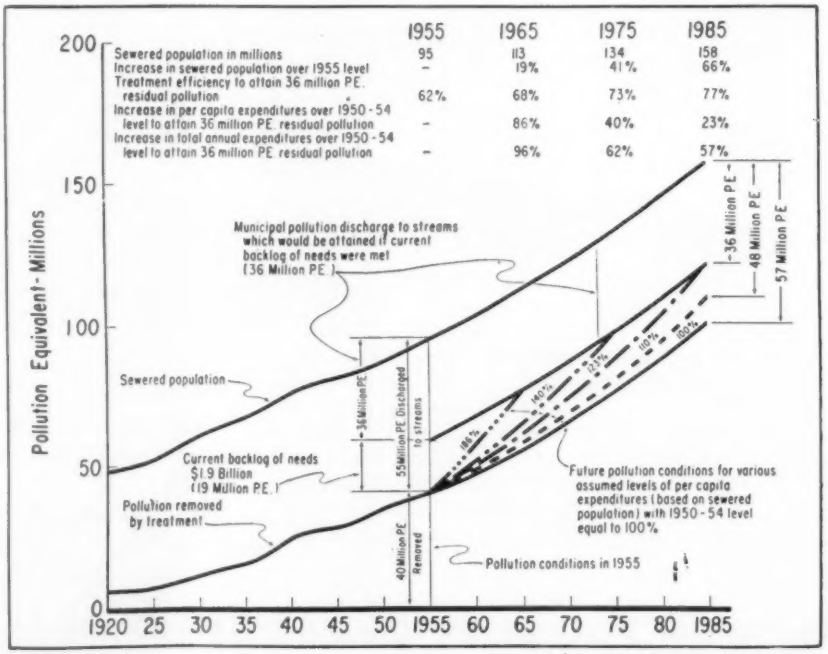
Graphic Panel Type Instruments

Central control panels in treatment plants often become unwieldy and confusing when the ordinary rectangular-case instruments, each occupying 240 sq. in., are mounted on them. The graphic panel offers a relatively simple, understandable flow diagram of the process, with the components correctly styled and related to each other, with instruments located at the functional positions in the process. While the rectangular case recorder-controller, with its 12-in. chart, is about 14 x 17 in., this is replaced by a 6 x 6 in. instrument with a strip chart. It thus is possible to place all of the essential records at a central point on a comparatively small panel. The graphic panel helps the public understand treatment processes. The cost of the two types is substantially the same.

"Graphic Panel Type Instruments For Water and Sewage." By R. H. Babcock, The Foxboro Co. PUBLIC WORKS, November.

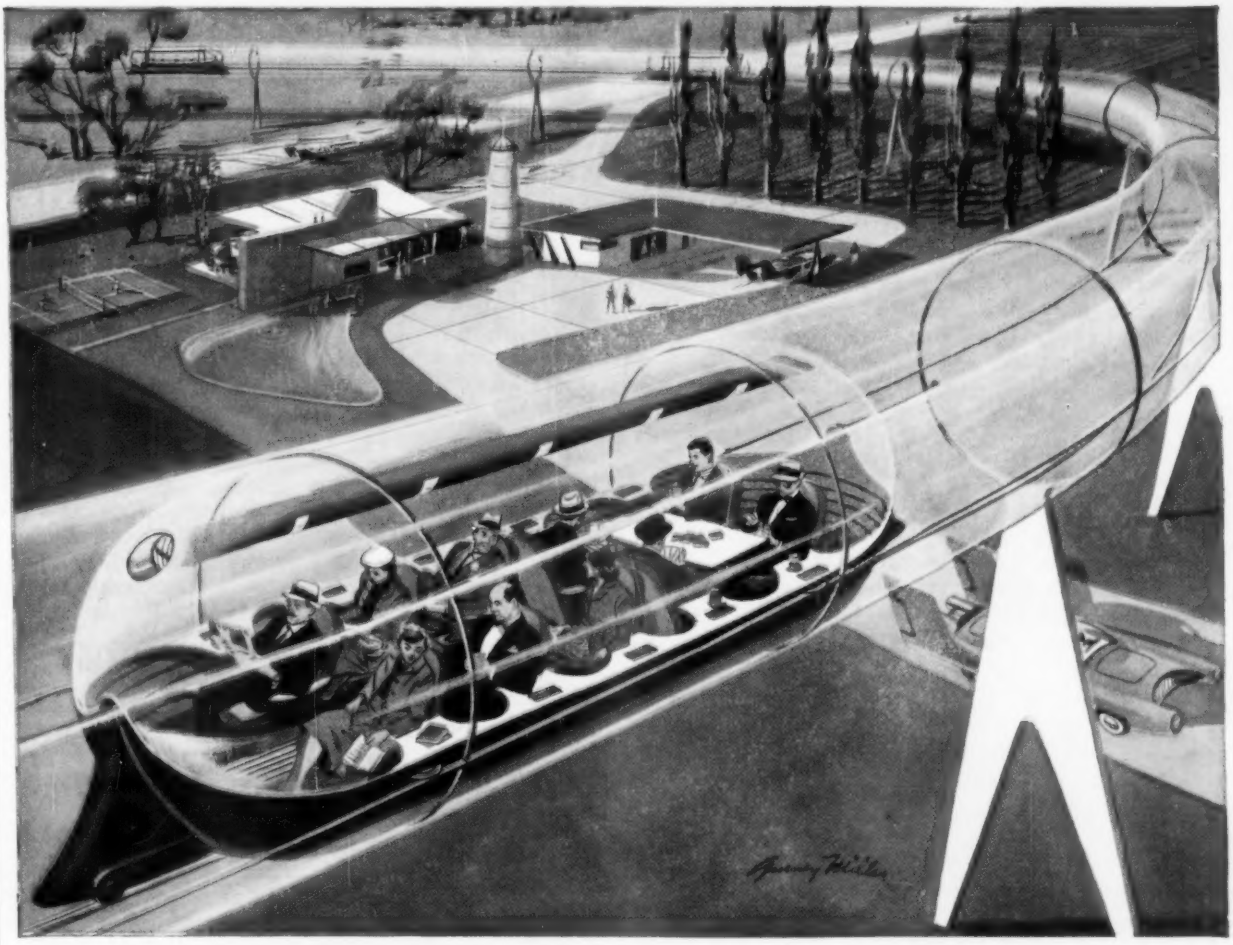
Training For Plant Operators

The Florida Water and Sewage Operators Ass'n, in considering the



Courtesy Engineering News-Record

● **FUTURE needs for sewage treatment as visualized by the Public Health Service.**



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developing of a program of correspondence study courses for sewage plant operators, received questionnaire information from 163 such operators in the state concerning their responsibilities and educational levels; their duties; and training, needs for advancement and better performance on their present job. This article analyzes their replies. It shows that formal schooling appears to bear some small relationship to the grade of certification held; those with higher job titles have had more schooling; as a rule, laboratory workers have the highest educational levels. As to work done, the foremost job in maintenance is minor repair; in operation it is pumping; in testing, the determination of chlorine residual. The subjects they wished instruction in were sewage calculations; basic arithmetic; plant operation; chemistry; sewage terminology, and knowledge of equipment and repair.

"A Basis for a Training Program for Sewage Plant Operators." By Theodore Jaffe and John P. Daughtrey, Prof. and Instructor, Univ. of Florida. *Water & Sewage Works*, October.

Irrigation With Waste Water

The author describes briefly the use of sewage plant effluents at Golden Gate Park, San Francisco; at the Hyperion plant of Los Angeles; the sewage farm of Fresno, Calif.; also at Bakersfield and Ontario, Calif. Several instances of irrigation with industrial wastes are referred to. The subjects of mineral quality of the waste water, nuisance and health hazards, and soil permeability and irrigation rates are discussed.

"Irrigation With Waste Water." By Ralph Stone. PUBLIC WORKS, November.

Activated Sludge Treatment of Milk Wastes

Seymour, Wis., in 1935 built an activated sludge plant with downdraft mechanical aeration, digester and sludge beds. For several years it worked exceedingly well, producing an effluent with 90 to 95 percent reduction of BOD. But great increase in wastes from a milk processing plant, from 250,000 lb. of milk processed a day to 83,000,000 lb. in 1954, and the establishing of a canning plant, greatly overloaded the plant. The plant was improved and enlarged in 1953 by the addition of a pre-aeration unit with downdraft mechanical aerator; of a comminutor; another primary tank;

another aeration tank; replacement of the aerators in two of the original three tanks with Walker impingement-type diffused aeration units; and in 1954 this type of aerator was placed in the other tank also. A coagulant was added during the pea, corn and beet canning season. With these changes, excellent results were obtained; BOD reduction of 97.6 percent before the canning season; 90.3 percent to 99 percent during the canning season, when 800 lb. per day of coagulant was used. The digester is undersized, and part of the sludge is spread on agricultural land, using a tank truck. The pre-aeration unit greatly increases BOD removal in the primary and serves as an excellent flocculation unit when chemicals are used.

"Seymour Solves Unusually Difficult Waste Treatment Problem." By M. O. Clinton. *Water & Sewage Works,* October.

Cleveland Pioneering In Sewage Treatment

Cleveland, Ohio began serious consideration of its sewerage problem in 1896, when Hering, Benzenberg and Fitzgerald made a report. Later, in 1912, R. Winthrop Pratt reported, advising treatment at three plants. Methods of treating were investigated at a testing station and demonstration plants, including a Reinsch-Wurl screen, and, in 1916-17, an activated sludge plant. The results obtained at the latter furnished much original and valuable information and furnished the basis for the subsequent design of today's Easterly and Southerly plants. The author describes these plants as originally constructed in 1922 and 1928; and as now constructed and operated.

"Progress—From Testing Station to $38 Million Sewage Works." By William L. Havens. *Wastes Engineering,* October.

Safety Measures At Milwaukee's Plant

The Milwaukee, Wisc., Sewerage Commission requires all employees engaged in work that may cause eye injuries to wear safety goggles. It provides ventilating systems in all danger areas, and instruments for detecting gas leaks; also acid-proof clothing and face shields for men working around acid-handling facilities. It makes semiannual physical examinations of sand blasters and warehouse crane operators and annual chest X-ray examinations for employees and families. Semiannual instruction for resuscitation is given by the Red Cross; and quarterly instruction in fire fighting by the Fire Dept.

"Sewage Plant Accident Prevention." *American City,* October.

Self-Propelled Trench Shield

Contractors for a storm drain in Long Beach, Calif., are using a trench shield that combines the unusual features of self-propulsion and of trailing wales. It is pushed forward by means of four 50-ton hydraulic jacks which push against 3 x 12 sheeting already installed. When the shield has been pushed ahead 12 in., another pair of sheeting members are installed. At each side of the bottom of the shield is a plow that cuts a 3-in. trench 8 in. deep to receive the bottoms of the sheet piles. A pair of adjustable shoes are installed at the lower leading edge of the shield to permit maintaining the proper ditch grade. Trailing wales are attached to the rear of the shield—four H-beams 14 ft. long, which support the sheeting temporarily until it is possible to install permanent wales and braces. The shield is adjustable for

trench widths of 8 ft. 2 in. to 11 ft. 8 in., and for depths up to 15 ft.

"Self-Propelled Shield Braces Deep Trench." *Engineering News-Record,* Sept. 15.

Subsurface Sand Filters

Where the soils are too tight for the use of conventional types of sub-surface disposal of effluents from individual sewage treatment plants, the Health Dept. of Erie County, N. Y. has found subsurface sand filters to give satisfactory results if properly constructed. About 1500 of these have been installed in Erie County over a period of almost five years, at an average cost, including septic and contact tanks, of $500 to $600 for a one-family house. In a study of 19 of these, the septic tank effluents in the to 215 ppm, and the filter effluents middle quartile had a BOD of 70 2½ to 11 ppm. The suspended solids were reduced from 60-200 ppm to 6-22 ppm. The dissolved oxygen content ranged from 32 to 70 percent saturation. The investigation showed that a high quality, clear, stabilized and inoffensive effluent can be consistently obtained from a properly designed, constructed and maintained subsurface sand filter treatment system for many years.

The plants installed under the instructions of the county health officials were based on an application rate of 1.15 gal. of septic tank effluent per sq. ft. of sand surface per day, and a daily flow of 150 gal. per bedroom per day. The sand was specified to have an effective size of 0.30-0.60 mm and uniformity coefficient not greater than 3.5. This sand is placed in a bed 24 in. deep, over a system of drain pipes, and is covered with 4 in. of gravel in which are bedded lines of distribution pipes spaced 6 ft. apart. The whole is then covered with 4 ft. or more of top soil. A dosing device is necessary ahead of the sand bed where the total length of distributors exceeds 200-300 ft.

"Experience With Subsurface Sand Filters." By J. A. Salvato, Jr., Chf. Bureau of Gen. San., County Health Dept. *Sewage and Industrial Wastes,* August.

Treating Fermentation Process Wastes

Experience during two years of operating a biofiltration plant treating wastes of the American Cyanamid Co. from fermentation manufacturing processes, revealed the necessity of making various modifications in the original plant. These included revising concepts of loadings, strengths of wastes applied to filters, suitable filter media, and methods of multistage operation. This experience has indicated that, in operating aerators and trickling filters treating fermentation wastes, a primary aerator can, if properly and continuously seeded, be a valuable tool; that series operation of the biofilters will result in the highest over-all BOD reductions. BOD loadings as high as 5,000 lb. per acre-foot per day may be applied to biofilters; but sustained loadings of this magnitude may result in clogging of the filter and even the subsequent death of the filter growth. Periodic changes in the nature and extent of the food supply to the filter biota will tend to decrease the magnitude of growth and lessen the detrimental clogging conditions. Blast furnace slag apparently is attacked by the fermentation waste and caused to disintegrate. Most important, a biological treatment plant must be inhabited throughout by a healthy community of organisms. The biological degradation of any one treatment unit of the plant will lead to the failure of the other plant units if quick corrective action is not taken.

"Experiences in Treating Fermentation Process Wastes." By H. W. Pitts, San. Eng., American Cyanamid Co. *Sewage and Industrial Wastes,* August.

Progress in Waste Treatment

In this article, manufacturers tell of developments in mechanisms and materials used in treating wastes. These include vacuum filter cloths; plug valves; bio-activation processes; metering, control and feeding; instruments; gas engines; dewatering sludge; heat-treating sludge; biofiltration; vacuum filtration; electrification; water re-use; oxidation of phenolic wastes.

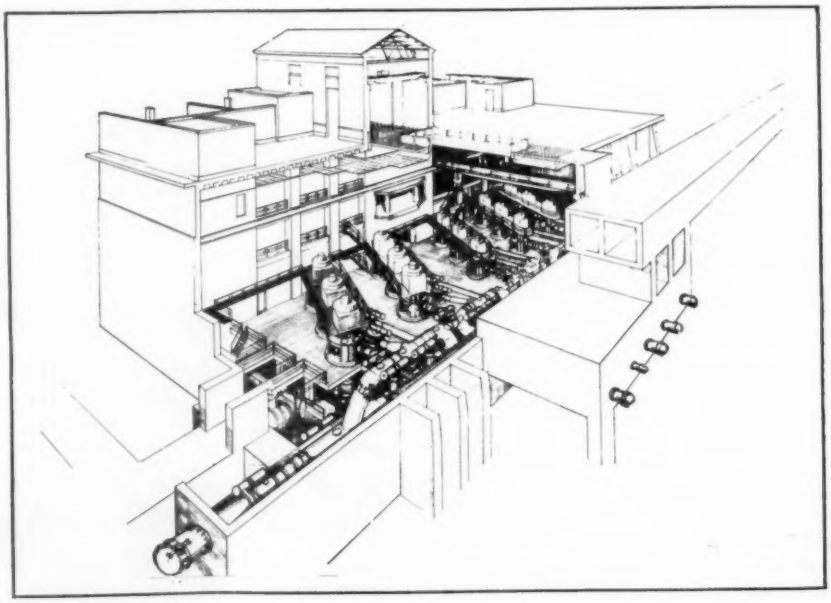
"Manufacturers Tell of Progress in Processes and Products." *Wastes Engineering,* October.

Repairing Small Damaged Sewer

An English contractor recently repaired a 6-in. vitrified clay sewer in an unusual way. The sewer was 250 ft. long, laid 25 yr. ago to drain five houses. Excavation of the sewer line was undesirable for several reasons. A smaller pipe could carry all the sewage, the grade being

Dalecarlia Pumping Station, Washington, D. C.

FIFTEEN NEW vertical shaft centrifugal pumps complete with synchronous motors are being installed in the new Dalecarlia Pumping Station, Washington, D. C. The pumps, manufactured by Worthington Corporation, will provide the new plant with a daily pumping capacity of 477 million gallons and will make it one of the most outstanding vertical pump installations of its kind in the country. Each pump will be driven by synchronous motors supplied by Electric Machinery Mfg. Co. and the combined weight of each pump and motor is approximately 56,500 pounds. A view of the installation is shown below.



ample, and a line of 4-in. "pitch-fibre" pipe was threaded through the 6-in. pipe. The new pipes were furnished in 4-ft. lengths. Three openings in the old sewer were made for inserting the pipes, and the tapered joints of each section of pipe were driven home by hammering at one end of each section after it had been laid.

"Pitch-Fibre Pipes Solve Sewerage Problem." By T. H. Jackson. *Municipal Engineering* (England), Sept. 16.

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Wet Area Fills

(*Continued from page* 69)

least alleviate, "mud waves". These may produce structural problems, interfere with normal drainage and create odor and insect nuisances by stirring up organic silt.

Tidal Areas. (Type 2)—Subdivide area into several lagoons by means of dikes for better control of operations and for limiting and alleviating potential nuisances. Limit filling operations to one lagoon at a time. Size of lagoons should permit one winter's placing of the initial in-water layer.

The initial in-water layer in each lagoon should be made during the cold winter months to a compacted elevation about 2 ft. above maximum high water. The alternate solution—filling in up to water level with clean earth—may be more satisfactory but will be much costlier.

Lagoon dikes should be of adequate strength to withstand possible mud wave action and of such materials and proportions as to reduce permeability to the minimum. Noisome leachings can be prevented entirely by watertight, shallow, light-weight, interlocking steel or wood sheet piling. Outshore faces should be rip-rapped against erosion.

Depth of initial refuse layer should be held to the minimum with deposition in strips, moving out with a pincer operation to confine underlying mud and avoid mudwaves.

Ponds, Quarries and Similar Areas (Type 3)—Direct dumping into water should be confined to cold weather only. Accordingly, place initial inwater layer to a depth slightly above high water during the winter. Warm weather filling should be limited to the secondary, over-lying layers.

Displaced water should be discharged at low velocities over adjustable weirs preceded by trash screens. A quiescent, shallow, near-uniform discharge will promote settlement of most suspended matter and should reduce carry-over of materials to the minimum.

Heavy chlorination of effluent may be necessary depending on temperatures, nature of receiving waters and on other local conditions.

For each of these three types of "wet" fills the question arises on the size of equipment and on the hazards of "sloughing-off" of refuse at the dumping face. Experience has shown when the top of the initial lift is at least two feet above maximum water level there is little risk of edge shearing or of losing equipment over the bank. Both rubber tired and crawler equipment can work safely within a few feet of the active bank. The interlocking nature of mixed refuse, with its elastic components, is further aided by the continuous compaction from the heavy operating equipment and develops angles of repose averaging about one on one, even when dumped into water.

Development—An advance gen-

eral plan of the proposed long range development of the site is most useful in promoting an efficient fill. Such a plan will help to determine the final grades and depths of fill, the drainage system, amount of cover material required, potential volume of fill and its life, etc. Future crossings by highways and bridges, heavy industrial buildings, and similar improvements may dictate the omission of fills within the limits of these future structures. Programmed future construction of sewers, storm drains or other large conduits might best be advanced and completed prior to the refuse filling operation.

Specific Examples

To illustrate the above elements of preliminary studies, planning of operations and advance studies of long range development consider two typical landfills actually made in "wet" areas. The first required refuse deposition on generally marshy and partially under-water areas. The second required dumping into tidal waters varying in depth from 0 to about 10 ft. at low tide.

Sketches on pages 66 and 67 show major aspects of these steps for a refuse fill in Type 1 "wet" area. It need only be added that the site preparation, by private contract, stockpiled 860,000 cu. yards of excellent sandy material dredged out of an adjoining bay at an average cost of $0.38 per yard. This fill operation was exemplary from start to finish. In spite of the proximity to a much travelled boulevard and a medium income residential area, this fill instead of being a source of complaints received private and public praise. Now largely completed and mostly overgrown with nature sown grass it already is a marked improvement over the former valueless, insect ridden marsh land. Further enhancement of this area is planned through a park and beach development now economically feasible because of the "for free" land reclamation.

Similarly, other illustrations outline the detailed steps planned and used for fill in Type 2 "wet" area. In this instance since suitable, silt free, clean sand was economically unavailable from the adjoining waters, the cover material was trucked in. The underwater areas proposed for filling were divided into three large lagoons through the construction of circumscribing stone and earth dikes. This lagooning confined dumped refuse and helped

control potential mud waves. Each lagoon was drained by means of a large wire mesh screen anchored to wood piling, both constructed in an opening through the outshore dike. This opening permitted the cleansing of the confined waters by tidal action, at the same time preventing the dispersal of all floating material It should be noted that on filling these three lagoons, another three similar lagoons, further outshore and in deeper water, were constructed and are being filled outshore.

Costs

Total and unit costs of fill in "wet" areas will vary of course, with local conditions. The major items influencing cost are: size of operation, type of terrain, availability of suitable cover, degree of operations refinements required, labor productivity and hourly rates, and the division of work between municipal and private forces. The values shown on page 69 although accurate for their conditions, are presented merely as general guides.

• • •

Dutch Elm Disease

(*Continued from page 92*)

by mechanical means. The virus has been transmitted to healthy trees by grafting.

The leafhopper over-winters in the bark of elms in the egg stage, the eggs being laid during late summer. During Spring, usually about the latter part of April or the early part of May, young nymphs hatch from the eggs and begin feeding on leaf veins, extracting plant juice. Adults also feed in the same manner and if feeding occurred in diseased trees, the insect becomes infective and may transmit the disease to healthy trees.

While Dutch elm disease can be diagnosed correctly only in laboratories equipped for identifying the fungus, elm phloem necrosis can be identified readily. By cutting through the bark around the lower trunk and by prying the bark from the wood, the inner bark can be examined. If this inner bark lying next to the wood is yellow, sometimes flecked with brown or black, the elm probably is diseased with phloem necrosis. If the inner bark is white and turns brown only after exposure to air, the leaf symptoms are not caused by phloem necrosis. The suspected discolored bark will give off a faint odor of wintergreen. This is especially noticeable if

placed in a stoppered vial for a few hours.

To control phloem necrosis, use a 6 percent DDT foliar spray when the elm leaves are full grown, usually in June and before July 1. The second foliar spray should be applied about mid-August.

Elm Leaf Beetles

This beetle is one of the most destructive pests of the elm tree throughout eastern United States, skeletonizing the elm foliage as far West as Indiana and Kentucky. Infested trees have a general yellow appearance of the foliage with a great number of leaves skeletonized.

The adult insects are yellowish to dull green in color and approximately ¼ inch long with an indistinct black stripe on either side. The larvae are yellow to black in color and will be found crawling about the trunk and in great numbers at the base of the trunk. They, too, skeletonize leaves.

The beetles fly to elm trees shortly after these come into foliage in the Spring. They deposit double rows of yellowish eggs resembling miniature lemons on the under-surface of the elm leaves. The larvae hatch from these eggs and feed for about three weeks; then they crawl down the trunk of the tree. At the base of the trunk or in a sheltered place they pupate and emerge as adults. There are two or more generations a year, depending upon the locality.

If trees are thoroughly sprayed with a mist spray containing 4 gallons of 25 percent DDT emulsion in 100 gallons of water or 25 pounds of lead arsenate and sticker in the same amount of water, the beetles may be held in check so that leaf injury will not occur. The spray should be applied when the leaves are nearly full-grown, or as soon as feeding is noticed. The trunk and base of the trees should be sprayed also.

In areas where both Dutch elm disease and phloem necrosis occur, as well as infestations by the elm leaf beetle, all the insects can be controlled by following a spray schedule with DDT and a miticide. The first spray with a mist blower should be 12 percent DDT with a miticide, applied in early Spring before elm leaves appear. The second application with a mist blower should be half of the above concentration, applied about June 15. The third spraying operation should contain the same insecticide as the second spray and should be applied late in July or early August.

PUBLIC WORKS
EQUIPMENT NEWS

Published Monthly **December, 1955**

Self-Priming Centrifugal Pump Delivers 150 GPM

The new Model 36S2 pump by Homelite is designed to work efficiently at low-noise-level, slow speed operation, and it delivers up to 9,000 gallons per hour. This pump can be used for work in suburban areas, on city streets and for night operations. It weighs 87 pounds, has a 28-foot suction lift and 65-foot total head, including friction. Automatic priming at 5-foot suction lift takes 9 seconds. It is powered by a single-cylinder, air cooled gasoline engine governed for speeds between 2,550 and 2,650 rpm at open throttle. For further information write to Homelite, Riverdale Avenue, Port Chester, N. Y. or circle **No. 12-1** on the coupon.

Pumping out manholes during night operations or in suburban areas is much quieter with the new Homelite pumps

Self-Propelled Spreader for Surface Treatment

The self-propelled "Spread-Master" power spreader, just announced by Flaherty, is designed to eliminate black streaks caused by foreign obstacles in cover-coat material, features heavy-duty power steering, improved gate design and improved double-acting mixing auger. Receiving hopper capacity is 4 yds; spread hopper capacity is 2 yds. and forward speed range from 1 to 15 mph. For further details write to Flaherty Mfg., Inc., Box 1042, Pocatello, Idaho, or circle **No. 12-4** on the coupon.

International's Newest Industrial Tractor

A new rubber-tired 42-hp wheel tractor, the International 300 Utility Model, designed for the industrial field, is powered by an IH C-169 gasoline engine and weighs 3,820 lbs. It is available either in a standard 5-speed transmission or with Torque Amplifier drive. Also, it has a power take-off, completely independent or transmission driven, and a hydra-touch equipment control permitting front and rear-mounted attachments to be controlled simultaneously or individually. For full details write International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill. or circle **No. 12-5** on the coupon.

IHC 300 Utility Tractor, shown here with Wagner ½-yd. shovel and backhoe

Tailgate Type Patching Mixer Has High Capacity

A new, improved model (30-R) of its Heat-A-Mix, the tail-gate asphalt patch mixer, has been announced by Wylie. Heat-A-Mix is a compact, high-capacity pugmill and material heater, self-contained with its own gasoline engine and propane or kerosene heating system. New features include a forward - and - reverse transmission, which makes it possible to retain material in the pugmill until it reaches the temperature desired. The design of the heat-jacketed pugmill makes it flash-proof, with no direct flame in contact with asphalt material. The entire unit, by means of its removable, adjustable legs, can be quickly transferred from one truck to another on the road without a crane or hoist. For more write Wylie Mfg. Co., Box 7086, Oklahoma City 12, Okla., or circle **No. 12-2** on the coupon.

Heat-A-Mix asphalt-patch mixer has compact pugmill and material heater

Cat's D4 Tractor Oil Clutch

A new oil clutch, now available as an attachment for D4 Tractors, has been announced by Caterpillar. It features metallic-faced clutch discs, a self-contained gear-type pump and oil supply clutch brake for easy gear shifting. The oil clutch is especially desirable in bulldozing work and other jobs where frequent engagement, disengagement and slipping of the flywheel clutch are necessary. For additional information write Caterpillar Tractor Co., Peoria, Ill., or circle **No. 12-3.**

Steel Garages for City, County, State and Airports

The new, quickly erected, inexpensive garage and hangar are enabling city, county and state engineers and airport managers to offer truck and light plane storage and protection at low cost. Unitized. the garages are of an interlocked design that enables quick construction of a building of any size. Additions can be made easily and the design makes best use of available areas. The doors are of the fold-up type that permits wider opening and they are available with either motorized or manual drive. The buildings come precut and knocked down for easy assembly. For further information, write The Heltzel Steel Form & Iron Co., Dept. AH, Warren, O., or circle **No. 12-6** on the coupon.

Front-End Loader and Backhoe Combination

Ottawa Steel announces that they are now manufacturing the Ottawa industrial front end loader and industrial backhoe for the J. I. Case Co. 420 and 425 tractors. The Ottawa backhoe is available in two models for each tractor. One model digs 8½ ft. deep, the other 11 ft. and automatic ejector buckets are available for insuring full dump of every load, even of sticky material. It is equipped with wider outriggers which increase in width as down pressure is applied, to give greater stability under adverse digging conditions. The Ottawa loader has four double acting hydraulic cylinders; two to raise, lower, hold, and provide down pressure on the bucket, and two to dump and retract the bucket. Simultaneous lift and bucket action, coupled with a bucket level indicator, permits the proper positioning of the bucket during the lifting or lowering cycle. For more information write Ottawa Steel, P.O. Box 38, Ottawa, Kansas, or circle **No. 12-7** on the coupon.

New Forward-Tipping Bucket for Truck Loader

Holmes-Owens truck loader with new shoveling bucket that dumps into other trucks.

An important development in material handling is the introduction of the new Holmes forward-tipping bucket that now permits the Holmes-Owen truck loader to be used as a loading unit for other trucks. The new type bucket is hydraulically operated by controls which are located inside the cab on the steering column. It may be rotated to any position up to 120 degrees. The entire loader is hydraulically operated from the cab by the truck driver. The unit has the capacity to lift ½-yard of material per bucket, and to load the average truck in approximately 4 minutes; it can be installed on most 1½ to 2-ton trucks with any standard type dump body. For further details write to Ernest Holmes Company, Chattanooga, Tenn., or circle **No. 12-8** on the coupon or reply postcard.

Allis-Chalmers Introduces "Forty-Five" Grader

Allis-Chalmers is introducing the forty-five motor grader, a new heavy-duty unit powered by a six-cylinder, 4-cycle diesel engine with a rated 120 maximum brake hp at 1600 rpm. The engine delivers power for forward speeds up to 20.6 mph and to 7 mph in reverse. The grader can be throttled down to one-half rated speeds without loss of rim pull. A finger-tip control box with toggle-type linkage affording increased leverage for smooth, accurate operation of moldboard, wheel lean and scarifier has been developed. In addition to power steering, hydraulic brakes for the tandem wheels, mechanical parking brake and leaning front-wheel axle, there are also available 10 and 14-foot moldboards, a hydraulic shiftable moldboard, bulldozer and scarifier with a maximum pressure of 9,200 lbs. For additional information write Allis-Chalmers Mfg. Co., Tractor Group, Milwaukee, Wisc., or circle **No. 12-9** on the coupon.

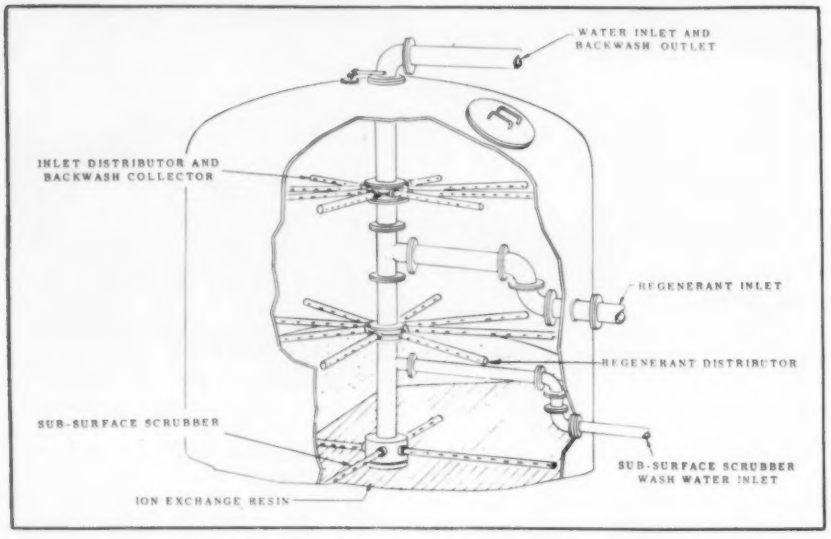
Batching Plant on Wheels

The Noble-Mobile is a ready-to-operate batching plant that drives the highways within legal load limits directly to the job site. It utilizes bulk cement and the aggregates are charged with scooploader, conveyor or clamshell. Output is 60 yards per hour or more to truck mixers. For more details write Noble Company, 1860 Seventh Street, Oakland 20, Calif., or circle **No. 12-10** on the coupon.

Heavy-duty Allis-Chalmers 23,800 lb. Forty-Five motor grader

New batching plant on wheels, introduced by the Noble Co.

Sub-Surface Scrubber Helps Backwash of Softeners



Internal arrangement of sub-surface scrubber for softeners and pressure filters.

A sub-surface washer, developed by Graver, is being used in demineralizers, zeolite softeners and filters where excess fouling of beds has been experienced. Channeling and short circuiting will result in such beds unless the obstructing solids are broken up and removed. The sub-surface scrubber has been successful in breaking up these solids, preventing bed clogging and permitting effective backwashing at normal rates. For further information write Graver Water Conditioning Co., 216 West 14th Street, New York 11, N. Y. or circle **No. 12-11.**

Complete Line of Attachments for Wheel Tractors

A new and complete line of practical attachments is now made available for International and Farmall tractors by Rocklin Mfg. Included is a center mount grader blade for the International 300, which features an exclusive low silhouette for ample clearance. The 66-in. steel blade has a 4-way reversible hard cutting edge and angle, with pitch and out-of-parallel adjustments. Another attachment for International 300 and Farmall 200, 300 and 400 tractors with fast-hitch is the Rocklin rear-mounted scraper and leveling blade. With a reversible 66-in. steel blade, it scrapes, levels, pushes and piles equally well and is exceptionally versatile in back filling. The Rocklin sawmobile attaches directly to the International Fast-Hitch and 3-point adapter and is equipped with a 30-in. circular steel saw blade. Also included is a heavy duty tractor crane which quickly mounts on the fast-hitch and 3-point adapter to handle all heavy lifting, loading and moving jobs. The carrier and tow unit completes this new line of attachments. An extra heavy duty bumper provides positive protection for tractor grill and front end while pushing or pulling heavy loads and working in dense bush. Further information from Rocklin Manufacturing Company, 110 South Jennings, Sioux City, Iowa, or circle **No. 12-12** on the coupon.

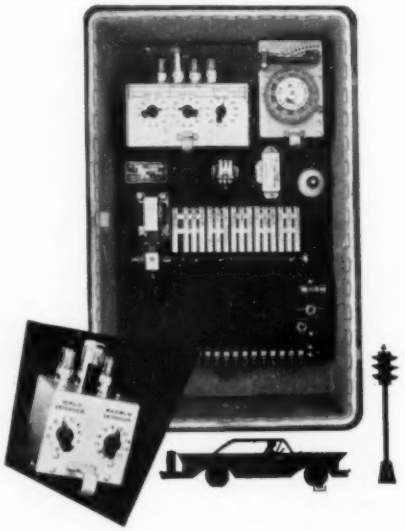
Center mounted blade, one of the many wheel tractor attachments by Rocklin

3-Way Solenoid Valve Design and Operation

For automatic and remote control of valves and other types of equipment, the Automatic Switch Co. has introduced a greatly simplified type of 3-way solenoid valve. Just three moving parts, two diaphragms and one solenoid core, are utilized in this internal pilot operated valve. Featuring absolute tight shut off of liquids and gases and rated at 250 psi, the valve may be converted quickly in the field from normally closed to normally open positions. Manual operation is provided in the event of power failure. For full details on this Bulletin 8316 valve write Automatic Switch Co., 391 Lakeside Ave., Orange, N. J., or circle **No. 12-13** on the coupon.

Semi-Actuated Traffic Control

The new semi-actuated control, announced by Southern Signals, has electronically timed vehicle extensions, maximum extensions, and pedestrian extensions, all of which are incorporated in a compact jack mounted electronic timer assembly, operated in conjunction with the pre-timed, synchronous timber and camshaft assembly. All functions of



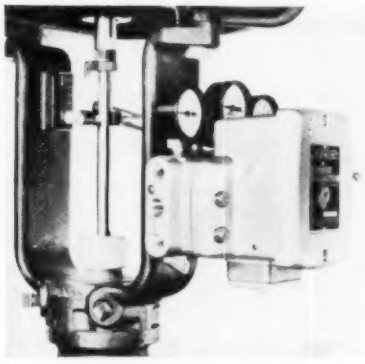
the controller operation, both mechanical and electronic, can be checked visibly during the operation of the equipment. For more detailed information write Southern Signals, Inc., P. O. Box 1303, 222 Beach Street, Shreveport, La., or circle **No. 12-14** on the coupon.

New Hydraulic Earth Borer

This hole digger, known as the Holan 4401-H hydraulic earth borer, features smooth operation and easy maintenance, with no damage due to stalling and reversible rotation The digger is driven by power take-off and a rugged gear-type pump powers a similar reversible gear-type hydraulic motor for rotation of the digger. A special double-winch arrangement enables the derrick to handle a pole and the digger at the same time. For full details write J. H. Holan Corp., 4100 West 150th St., Cleveland, O., or circle **No. 12-15** on the coupon.

New Valve Positioner Uses Motion Balance Principle

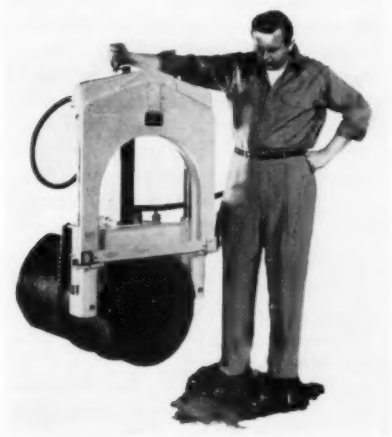
A new valve positioner, the Type C Vernier Valvactor, has been in-



troduced by Foxboro. The positioner overcomes friction and reduces line effects, speeding valve response to controller signal. Its applications include large-volume diaphragm motors and processes where controller-to-valve distances are long. A simple motion balance device, the positioner receives a controller output signal at a spring-opposed bellows which governs a flapper-nozzle relationship. For further information write the Foxboro Co., Foxboro, Mass., or circle **No. 12-16.**

Guillotine Saw for Cast Iron and Steel Pipe

A power pipe saw that cuts cast iron or steel pipe up to 16 ins. in diameter in a space only 32 ins. wide has been announced by Wachs. A double chain pipe vise clamps the saw to the pipe and it is ready to cut in a matter of seconds. The machined cast steel V saddle base as-

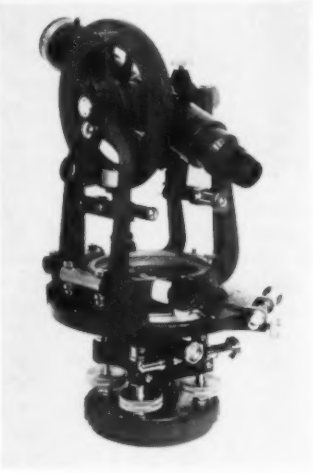


sures a square cut at right angle to pipe. For further information write to E. H. Wachs Co., 1525 North Dayton St., Chicago 22, Ill., or circle **No. 12-17** on the coupon.

CLASSIFIED ADVERTISING AND JOB OPPORTUNITIES

Survey Transit Features Many Improvements

A new 5¾" survey transit with many improvements for more precise setting is announced by Umeco. Included are rifle sights that bring the telescope on the target immediately, focusing knob through telescope axis that permits easy setting regardless of telescope position, improved graduated plate and other



new features. For further details, write Umeco Optical Division, 465 California St., San Francisco 4, Calif., or circle **No. 12-18** on the coupon.

New Portable Rotary Compressor

A portable rotary compressor announced by Worthington, the "Blue Brute 600-ft." features a new easy-acting clutch which allows operators to warm-up the engine before cutting in the compressor. The fully self-draining compressor eliminates settling of oil and moisture in any low areas of either cylinders, inter-stage chamber or discharge point. Additional features include two-stage oil separator, separate oil reservoir and air tanks and a shorter wheel base for easier handling on the job. For full details write to Worthington Corp., Harrison, N. J. or circle **No. 12-19** on the coupon.

Marking Survey Stakes

The new marker developed by W. D. Hargus consists of heavy water resistant paper sleeves which are placed over stakes. The sleeves are clearly marked graphically so that the excavating operator can read them as far as 600 feet away. The marker used to designate fill has an "F" at the top in black on a white background and cut markers are marked at the top with a "C." Both use a black border to designate

the depth of cut or fill at the stake. For full information write W. D. Hargus, 502 West "H" St., Brawley, Calif. or circle **No. 12-20** on the coupon.

Tandem Roller for Construction and Maintenance

A new and versatile type of roller, the model 55 tandem roller, is announced by Standard Steel Works. A feature of the roller is the even distribution of ballasting in both steel and water to provide 1½ to 2½-ton compaction. To provide weights needed from light patching to wide roll dimensions for smooth finishing, steel ballasts are removable in 70 lb. sections for a variety of compaction ranges. Automotive steering, finger tip controls, automotive type foot brake pedal, speed controller and throttle as well as water valve are easily handled from the driver's seat. For complete details and specifications, write Standard Steel Works, North Kansas City, Mo., or circle **No. 12-21** on the coupon.

Tandem roller, shown here on trailer, works close to walks on driver's side

Wood's Rotary Mower-Shredder

A rotary mower-shredder introduced by Wood, Model 42CL, is made to mount underneath the International Cub Lo-Boy Tractor and shred a 42 in. swath. It is specially applicable for mowing fence rows, road shoulders, estates, parks and lawn strips. A leaf mulching attachment is available. For complete information write Wood Brothers Mfg. Co., Oregon, Ill., or circle **No. 12-22** on the coupon.

Sanitary Engineering in World War II

MUCH of the history of the background of war-time sanitary engineering will be found in this volume—Vol. II, though the first one to be published—on preventive medicine. The formal title is *Environmental Hygiene*, made necessary by the fact that official publication policies prescribed for this series a book size too large to fill with the text prepared on sanitary engineering, so that other more or less allied material had to be included.

There are 56 pages on Water Supply and Purification; 48 pages on Waste Disposal; 18 pages on Rodent Control; 54 pages on Insect Control; 20 pages on the background of the great research program on insect and rodent control; 40 pages on preventive medicine measures in ports of embarkation and for persons in transit, of which there were some seven or eight million; a chapter on food management; a chapter on housing; a chapter on foreign quarantine—the measures taken to prevent the spread of disease from country to country and continent to continent; and three appendices. The water purification, insect control, rodent control and research chapters were written by Col. Hardenbergh; he and Col. Gilbert prepared the chapter on Waste Disposal; Col. Cleland prepared the section on ports and persons in transit. General Simmons provided some very fine introductions to several of the chapters.

We believe many of our readers will find this material highly interesting. It gives an account of the overhead view of the problems involving sanitary engineering, problems which had to be discovered, analyzed, sold to the Army and solved in the field. This was the first war, the first time in history, that the science of preventive medicine was able to overcome so many of the health hazards of the tropics as to permit our armies to operate effectively, no matter where they were. The chapters listed above tell briefly of the important part that sanitary engineers had in this great task. Few names are mentioned for it was and is Army policy not to do so. Nor is there much information on the detail application of sanitary engineering methods in the field. Such details will change; and it was the aim of the authors to point out the types of problems that may arise, if we are so unfortunate as again to be forced into a war, and to tell how they were handled administratively.

There are highlights that will interest many. In water supply, accomplishments included the fact that, in the field, "to the end of the war, there had been reported no major outbreaks of intestinal disease among troops that were traceable to water obtained from authorized Army water supply points." And for all stations in the ZI, non-potable samples after 1943 never averaged two percent and were normally nearer one percent. In waste disposal, an equally happy result was obtained in that "sewage disposal was eliminated as a serious problem." In his introduction to the chapter on insect control, Gen. Simmons terms the work done "one of the most spectacular programs for the control of insect-borne diseases . . . in the history of the world."

Everyone can be proud of the fine work done by the mostly nameless but highly skilled sanitary engineers who went into nearly all the dark corners of the world and there earned the admiration of the line officers, the doctors and the many other categories that go to make up the Armies of the United States; and there were other skills, which should not be forgotten, without which the engineers, doctors and line officers could not have done this tremendous job, including especially the entomologists and the laboratory specialists.

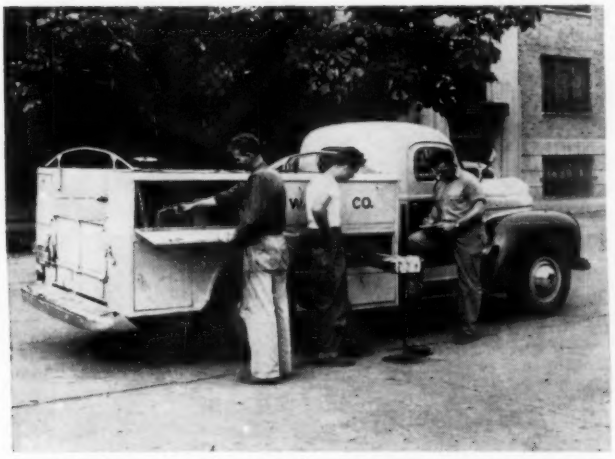
The scope and the variety of the problems that were encountered and that had to be solved will surprise many of our readers; perhaps it is also surprising that so few were insoluble or even extremely difficult. The fullest cooperation and all of the resources of the Medical Department were available without stint; special skills were always at hand. Possibly the greatest lesson to be learned from these brief chapters is a realization of the value of knowing how to work with other professional skills and what they can do.

Environmental Hygiene, Vol. II, Preventive Medicine in World War II. Available from the Superintendent of Documents, Government Printing Office, Washington 25, D. C. $3.50.

INDEX OF ADVERTISEMENTS

Worth Seeing

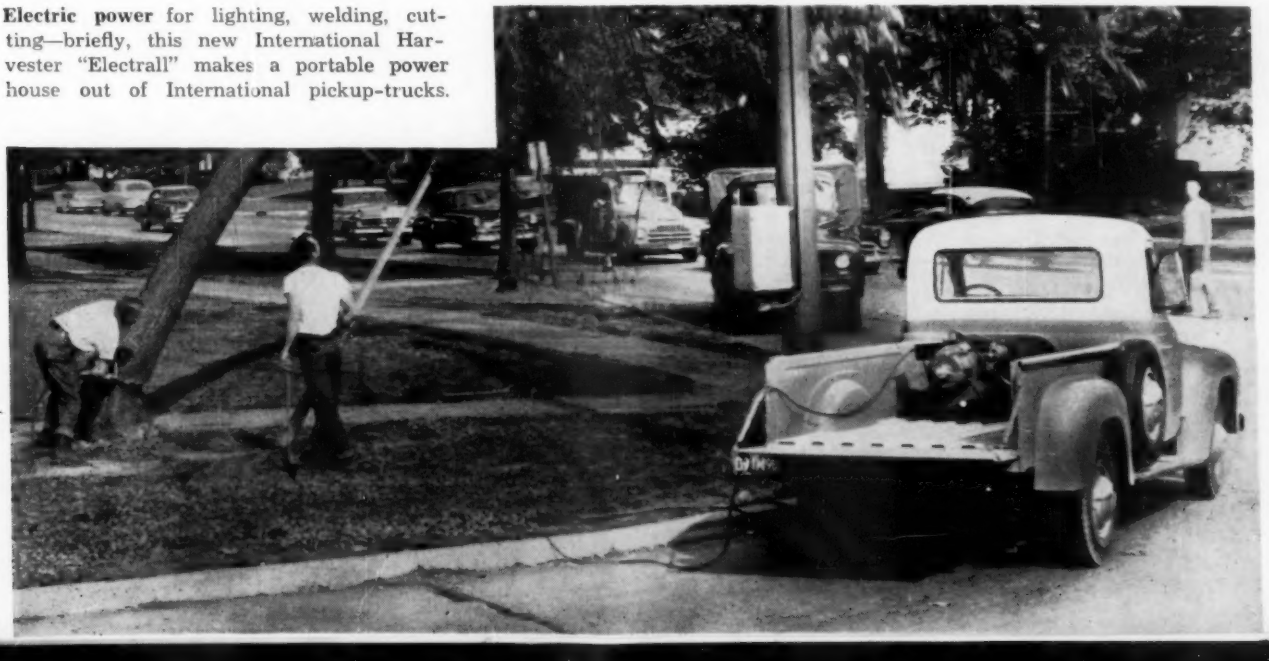
It won't stripe a skunk unless someone holds him but here is Kelly-Creswell highway striping machine that did miracles of simultaneous single, double and triple lines—broken or solid—in one or two colors on the new Ohio turnpike.



Payne Dean powered gate and valve operating equipment as shown above operates from truck transmission; gasoline powered models also are available. **James B. Clow & Sons**, Inc., Chicago, are now exclusive Payne Dean distributors.

Swinging a heavy tire into place, handling valves and hydrants, lowering pipe into a trench—all these common public works jobs are within the work-range of Pacific portable hoists of Burtchaell Heating Co., Portland 2, Ore.

Electric power for lighting, welding, cutting—briefly, this new International Harvester "Electrall" makes a portable power house out of International pickup-trucks.



WORTH TELLING

by Arthur K. Akers

★ ONCE MORE we have searched the ways of saying it, and there still seems no better than just this: A Merry Christmas to you all!

★ WE SPENT all of October's "bright blue weather" flying through the South and Southwest visiting with our advertisers and friends. Happily they are the same, and the list too long to publish. Everywhere we were struck with the contagious confidence and optimism "out in the United States." High points of the trip included the admirable A.P.W.A. Congress in Milwaukee and the very fine Southwest A.W.W.A. meeting in San Antonio. Also we helped Bill Wylie of Wylie Mfg. Co. stake out the site of their new plant in Oklahoma City which will triple Patch-Mobile production; heard H. T. James of Houston tell of sales of his new adjustable Jasco meter couplings now covering 44 states; and spent a morning with Mrs. Jimmie Thurmond, Johnny Cooper, and Tom Hopkins at Pak-Mor Mfg. Co. in San Antonio. Here, too, plant expansion is in progress and "the forward look" rampant.

★ CHARLES M. COMSTOCK is now upped to advertising manager, Dorr-Oliver, Inc., Stamford, Conn.; and Carlton W. Crumb to director of technical data.

★ WILLARD F. ROCKWELL Jr., president of Rockwell Mfg. Co., has been elected president of the Pennsylvania State Chamber of Commerce. And has started construction of *another* new Rockwell plant, in Porterville, Calif.

★ GERRY DIETZ, president of the R. E. Dietz Co., Syracuse, N.Y., will assume overall supervision of their lantern division sales on Jan. 1 upon Arthur W. Carr's retirement.

★ ALFRED B. KRECHTLER has been appointed eastern sales manager, Pleuger Submersible Pumps, Inc., Lancaster, Pa.

★ JAMES B. CLOW & SONS Inc. (pipe) and its subsidiaries, the Iowa and Eddy Valve Companies, are now exclusive distributors for the Payne Dean valve operating equipment.

★ PERHAPS you can find yourself in this picture of the Heil Company (Colectomatic refuse units) reception at the October A.P.W.A. Congress in Milwaukee.

★ ABE KRELL of Reliance Chemicals, that man of many enzymes, has just honored Col. Hardenbergh and ourself with certificates of full membership in the Loyal Order of Manhole Sniffers. It seems we helped Abe in "creating perfume from putrescence."

★ HYSTER CO., Portland, Ore., promotes Harold R. Lucas to manager of a new merchandise division of the general sales department.

★ ENTERPRISE ENGINE & Machinery Co., San Francisco, appoints Miles B. Sanger district manager, at Huntington, W. Va.

★ THEN there was the mountaineer who put a Maxim silencer on his shotgun at his daughter's nuptials. She wanted a quiet wedding.

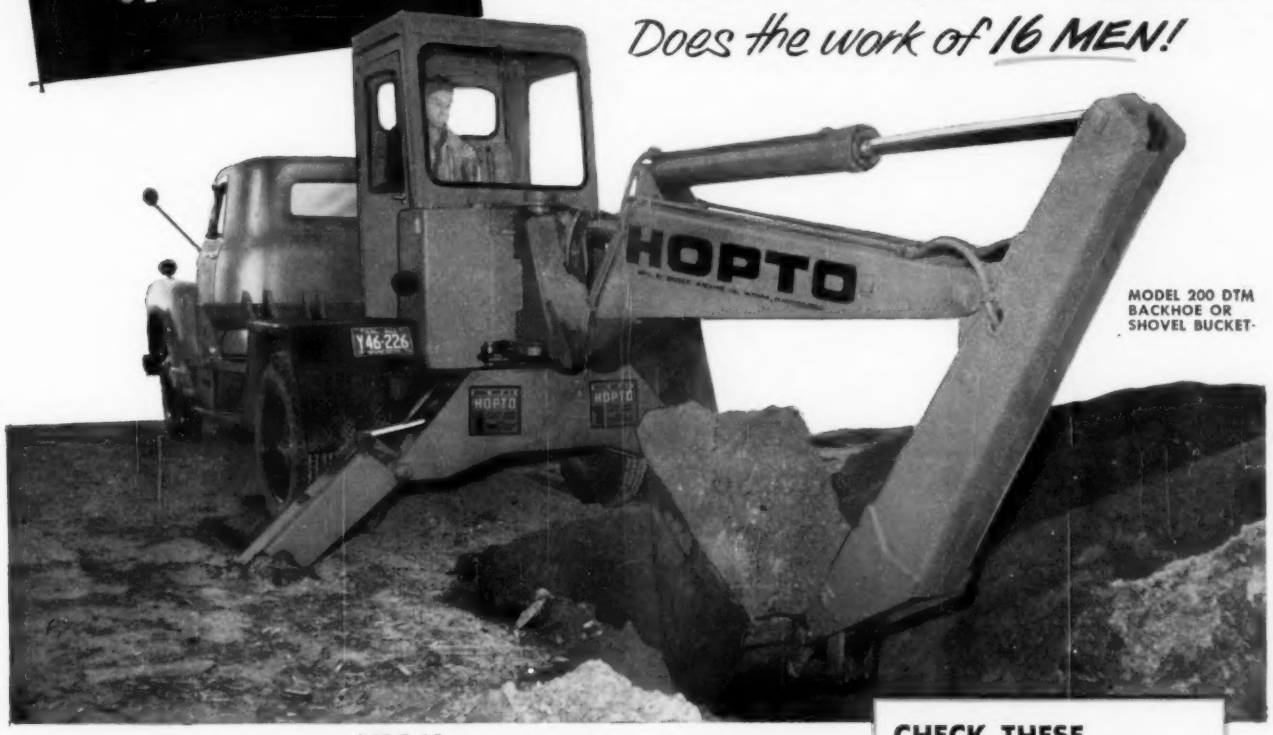
—Heil Sales Booster

- HYDRAULIC
- MOBILE
- LOW-COST

HOPTO

DIGGER • SHOVEL • CRANE

Does the work of 16 MEN!



MODEL 200 DTM BACKHOE OR SHOVEL BUCKET

digs DEEP ... *lifts* HIGH ... *easy to operate!*

Here's the fast-cycling HOPTO unit that equips you to profitably handle more jobs at lower equipment investment! The completely hydraulic HOPTO mounts on any 1½ ton or larger truck . . . one that may have been 'written off' but can still serve as a mobile base for this work-hungry, big-capacity unit!

Four simple and easily mastered control levers give finger-tip operation that is fatigue-free. That means more work done *more safely!* Retractable hydraulically operated outriggers quickly level unit . . . provide a solid, *safe* base from which to operate.

OTHER MODELS

From the large track-type continuous Badger Trencher down to the trailer-type HOPTO, Badger manufactures a complete quality line of digging equipment. HOPTO is also available as a power take-off operated or self-powered trailer model, as a unit for rear mounting on track-type or wheel-type tractors, as a complete self-powered wheel unit, the crawler unit shown below, the truck mounted unit illustrated above and a slightly smaller unit for truck mounting. HOPTO builds a *quality* unit to meet *your* needs, *exceed your expectations.*

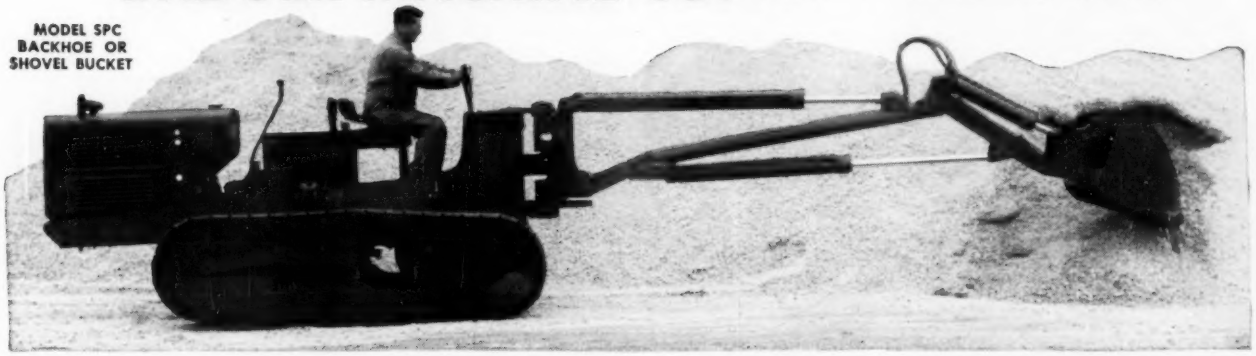
CHECK THESE HOPTO FEATURES

- Dipper stick extension tilts digging unit 135°; permits straight side, vertical digging. Eliminates hand work.
- Digs 11½' below surface.
- Lifts 13½' high with shovel bucket; more than 9' with backhoe.
- Alloyed steel hardened pins and self-aligning bearings at all pivot points.
- Variety of widths and types of backhoes and shovel buckets.
- Backhoes and shovel buckets have H & L teeth.

WRITE FOR FREE FOLDER!

BADGER MACHINE CO. DEPT. P WINONA, MINN.

MODEL SPC BACKHOE OR SHOVEL BUCKET



W&T Chlorinators with chlorine evaporators and master control panel (insert) used at the D.C. Sewage Treatment Plant.

DISTRICT OF COLUMBIA SEWAGE TREATMENT PLANT...

modern concepts of sewage chlorination control

Design of the Washington, D. C. Sewage Treatment Plant utilizes modern concepts of sewage chlorination control. W&T water diaphragm, high capacity chlorinators at the Plant are controlled from remote chlorine rate setting stations which operate by push button.

Remote control stations allow plant operators to change chlorine feed rates without leaving the operating center of the plant. Remote rate of feed indicators at the stations show the rate at which chlorine is being fed and immediately show changes in the rate of feed. Wallace & Tiernan Chlorine Flow Recorders give a permanent record of the daily chlorine feed of each chlorinator and also the total amount of chlorine fed to each point of application.

In addition to remote chlorinator control, W&T offers many other types of accurate and effective controls which can help the operation of your plant. From simple intermittent start-stop operation through automatic proportioning of chlorine feed to sewage flow, program control based on plant flow patterns, and ORP recorder-controllers, Wallace & Tiernan can answer your chlorinator control problem.

"Make Your First Choice Equipment That Lasts"

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

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